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IN THIS ISSUE

ORIGINAL ARTICLES:

- A WORK EVALUATION CLINIC—ITS OPERATION IN A UNIVERSITY MEDICAL CENTER WITH A REVIEW OF 2,000 EXAMINEES ..... *Jean Spencer Felton, M.D.*
- MODERN REHABILITATION—AN INDUSTRIAL PHYSICIAN'S APPRAISAL ..... *D. John Lauer, M.D.*
- CLUES IN EVALUATING PHYSICAL ABILITY ..... *Bert Hanman*
- THE DEVELOPMENT AND PRACTICE OF OCCUPATIONAL HEALTH IN CHILE ..... *Hernan Oyanguren, M.D.*

TOPICAL REVIEW:

- TOXICOLOGY OF SOME ALIPHATIC KETONES ..... *E. V. Henson, M.D.*

Complete Table of Contents on Page 3*a*

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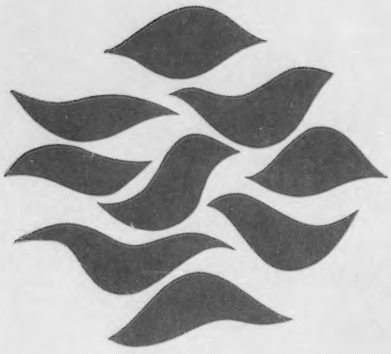

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TABLE OF CONTENTS

TEXT SECTION

Original Articles

A Work Evaluation Clinic—Its Operation in a University Medical Center with a Review of 2,000 Examinees.....577
Jean Spencer Felton, M.D.

Modern Rehabilitation—An Industrial Physician's Appraisal 589
D. John Lauer, M.D.

Clues in Evaluating Physical Ability.....595
Bert Hanman

The Development and Practice of Occupational Health in Chile.....603
Hernan Oyanguren, M.D.

Topical Review

Toxicology of Some Aliphatic Ketones.....607
E. V. Henson, M.D.

The President's Message 614

Book Reviews 615

Editorials

Worker Placement: Accentuate the Positive 617

"Toenail Turmoil" 617

Abstracts

Clinical Toxicology 618
Lee H. Miller, M.D., I.M.D.

Abstracts—Continued

Dermatology 619
Leo J. Miedler, M.D.

Internal Medicine 620
Leo J. Wade, M.D.

Industrial Hygiene 621
Edward C. Riley, M.D.

Noise and Hearing.....621
H. O. Parrack, Ph.D.

Radiation Health 622
Thomas S. Ely, M.D.

Reparative Surgery 623
Robert J. Trettin, M.D.

Mental Health 624
Graham C. Taylor, M.D.

Experimental Toxicology 625
Robert E. Eckardt, Ph.D., M.D.

Medical Care Administration.....626
Asa Barnes, M.D.

GENERAL SECTION

Industrial Medical Association

Officers and Directors *6a*

About the Authors *23a*

Directory of Advertisers *25a*

People and Events *27a*

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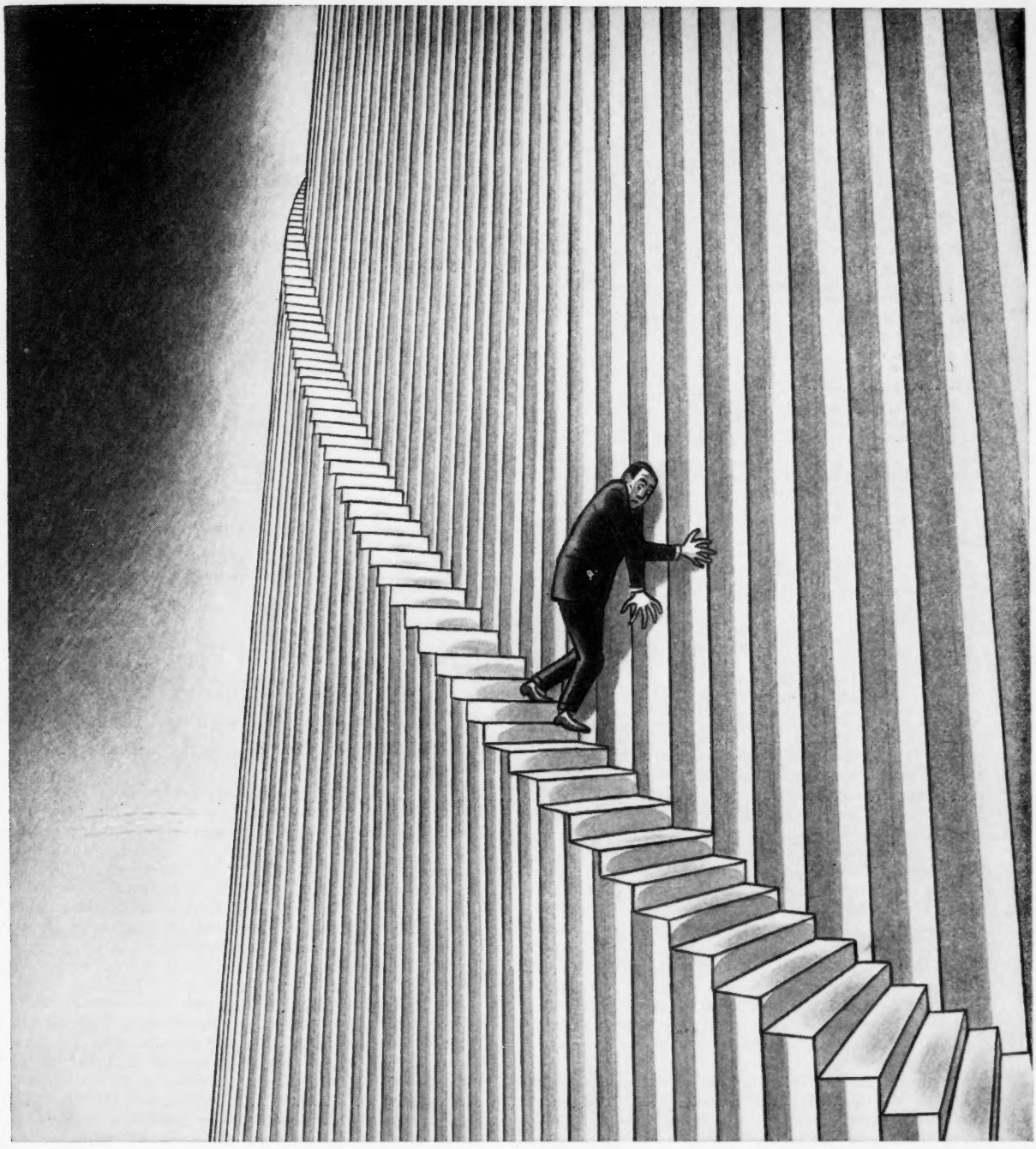

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The Industrial Medical Association was organized in 1915 as the American Association of Industrial Physicians and Surgeons. Its first annual meeting was held the following year. In 1951 the present name was adopted.

The purposes of the organization as stated in the certificate of incorporation (not-for-profit) are:

"The object of this Association will be to foster the study and discussion of the problems peculiar to industrial medicine and surgery; to develop methods adapted to the conservation of health among workers in the industries; to promote a more general understanding of the purposes of the medical care for employees; and to unite into one organization members of the medical profession specializing in industrial medicine and surgery for their mutual advancement in the practice of their profession."

Presently, the membership totals nearly 4000 physicians in the United States, Canada, Latin America, and other parts of the world. Physicians "who have an interest in Industrial Medicine" may apply for membership; specialization in this field is not essential. Regionally, the Industrial Medical Association has 14 Component Societies in the United States. Most Association members carry their membership through one of the component groups.

The Journal of Occupational Medicine, owned and published by the Industrial Medical Association, is sent monthly to each member as one of the advantages of membership.

The annual business meeting and convention is held in the spring. Since 1945, the convention has been held concurrently with the meetings of four other organizations having related interests—American Industrial Hygiene Association, American Conference of Governmental Industrial Hygienists, American Association of Industrial Nurses, Inc., American Association of Industrial Dentists. This combined meeting is known as the Industrial Health Conference.

The Occupational Health Institute, Inc., is a nonprofit educational organization created by the Industrial Medical Association to promote the cause of health in industry. Since 1951, the Occupational Health Institute has conducted the program of evaluation, approval and certification of Medical Services in Industry, on the basis of standards established by the Standards Committee of the Industrial Medical Association. This program was conducted by the American College of Surgeons for many years until its transfer to the Association.

The Association's headquarters office serves as a focal point for the Association's activities, and through its coordination of information regarding industrial health problems encountered throughout the country, it offers invaluable assistance to members on a host of specific subjects.

ANNUAL MEETING & INDUSTRIAL HEALTH CONFERENCE

War Memorial Auditorium, Rochester, N. Y. **April 26 to 29, 1960**

Journal of Occupational Medicine

A Work Evaluation Clinic

ITS OPERATION IN A UNIVERSITY MEDICAL CENTER WITH A REVIEW OF 2,000 EXAMINEES

Jean Spencer Felton, M.D., Los Angeles

It seemed universally admitted, that the present mode of administering relief to those who were able to work, without exacting labour in return, *was pregnant with ruinous evil, as well to the morals of the paupers, as to the resources of the country.*

—SIR EGERTON BRYDGES, Bart., M.P., "Arguments in Favour of the Practicability of Relieving the Able-Bodied Poor by Finding Employment for Them" (1817).

Part I. Organization and Operation

Growing from the depression emergency of the 1930's, the federal-state public assistance program, established by the Social Security Act of 1935, has become part of the way of life of almost 5,000,000 persons. Whereas the initial federal grants-in-aid to the states were offered in the specific categories of needy aged, needy dependent children, and needy blind, the 1950 amendments to the Act provided for a program to the permanently and totally disabled.

Oklahoma has proved to be a state with a great number of aged on public assistance, 43.5% of the group over 65 years of age having been welfare recipients during the period 1956-1957.[1] With the exodus of young persons from the state, this figure is likely to change. The number of persons receiving assistance (over $98,000,000) during the years of the most recent public welfare report[2] are these:

Category	Total Number
Old-aged assistance	102,334
Aid to dependent children families (ADC) (children aided = 53,518)	20,164
Aid to disabled (AD)	8,850
Aid to the blind	2,102
Aggregate	133,450

The statistical background is provided to demonstrate that the assistance program is of considerable dimension in this relatively young state, and that the monies expended in this fashion are but a part of the total budget of approximately $106,000,000 of welfare funds received.

The Reasons for a Work Evaluation Clinic (WEC)—In 1953, as the procedure had been in previous years, requests and authorizations for physical examinations of applicants for public assistance were forwarded to private physicians or private clinics throughout Oklahoma, for evaluation of the applicant's capacity for work, on a fee-for-service basis. In 1956-1957 there were 32,392 such requests.[3]

In the ADC category, the definition for eligibility[4] was this: "Physical or mental incapacity may be considered established when it is determined that a parent has a disability which severely limits him as to the amount or kind of employment which he can do." Disability is delineated further as being "any departure from a healthy condition and may be a disease, a deformity or a dysfunction . . . . The disability may be physical, mental or emotional in nature, provided that it is anticipated to be of not less than three months' duration." To be approved

Dr. Felton is Professor of Occupational Health, School of Public Health, University of California at Los Angeles. This work performed while he was at the University of Oklahoma School of Medicine, Oklahoma City.

for assistance in the AD program, this was the criterion[5]:

Total and Permanent Disability

In order to be eligible to receive aid to the disabled, a person must, in addition to meeting other factors of eligibility, have a permanent impairment which results in total disability.

Definition

A permanent and total disability is one which is established by medical evidence and which:

a. is permanent in nature, that is,

1. for which there is no known therapy which gives reasonable expectations of curing or controlling a disability within the foreseeable future; or

2. which is static or progressive so long as therapy is not available to the patient; or

3. for which therapy is inadvisable in medical opinion; or

4. for which therapy is inadvisable in the opinion of a reasonably prudent person

AND

b. is total in nature—that is:

which substantially precludes him from engaging in useful occupation, within his competence, such as holding a job or homemaking. Persons will be considered totally disabled if because of their disability, they are able to accept only such employment as is incidental in nature or which, whether full- or part-time, has to be adapted to the requirements of persons who cannot meet their own physical needs. These factors will be considered in relation to the person's normal role, that is, of wage-earner or homemaker.

In the examinations which were conducted there was the objective not only of identifying the disabling conditions but also of determining if these findings permitted or precluded substantial gainful employment; the physician's report was to bear such a recommendation. The program worked well throughout Oklahoma, but in some instances clear-cut decisions could not be made, or if there seemed to be a difference of opinion between two physicians, then a third was needed to make definitive the recommendation of one or the other. In complex clinical pictures, when opinions of specialists would be required for specific facets of the problem or when laboratory or radiologic examinations were needed which could not be obtained locally, examination by a "third party" also seemed indicated. "Cases" of this type comprised most of the material of the present study, the remainder consisting of the clinical assessment of persons making reapplication or currently receiving assistance. In the four year period of February, 1954, to February, 1959, examinations were conducted on applicants for assistance in two categories only, i.e., AD and ADC.

Operation of the Clinic—The patients comprising the caseload of the WEC are those applicants referred by the Medical Review Team (MRT) of the DPW. Appointments are requested in writing by the county public welfare directors throughout the state, and with this letter are received a completed "Physician's Examination Order," an authorization form, a "Medical Review Team Report on Permanent and Total Disability (or Aid to Dependent Children)," and a medical social summary. The MRT report lists the diagnoses provided by the client's original examiner but does not carry the physician's name or his recommendations. This was done purposely to have the WEC examination conducted as free from bias as possible.

The physicians comprising the examining group are all licensed practitioners in Oklahoma City, most of them graduates of the school, and recently having opened offices. Many are specialists certified by the American specialty boards, and many conduct comparable examinations in their private offices as preplacement physical examinations for one or more industrial organizations. The Clinic was under the direction of the writer who, because of experience in industrial medicine and in industry itself, tried to provide sound leadership to the group.

The Caseload—The WEC was activated February, 1954, and in the four years following 2,681 evaluation examinations were conducted. Of this number, 2,000 have been analyzed in detail and the characteristics of the applicants and the summaries of the findings and recommendations will be found in Part II. It should be reemphasized that of the four assistance categories, only clients concerned with AD or ADC have been examined. Within the past year some evaluations have been conducted on those persons applying for the disability freeze, but these data are not included in the summaries found in Part II. The 2,000 were selected from a slightly larger group of patients seen and recorded in sequence. This present study omits patients seen in the first few months when the WEC was being established and early errors in operation were being corrected.

Part II—Review of 2,000 Public Assistance Applicants Examined in the Work Evaluation Clinic

The Work Evaluation Clinic of the University of Oklahoma Medical Center has conducted examinations for the Department of Public Welfare on applicants, reapplicants, or recipients of public assistance in the two categories of AD and ADC. The evaluations in the first

group totaled 917, and in the latter, 1,083. The characteristics of the group of 2,000 are seen in Tables I through XIX.

It is somewhat disheartening to see that of the patients examined, 608 (30.4%) were under the age of 50 years. The group bulking large at a total of 850, would be the 50-59 year old segment, too young for old age benefits, and too old, with their disability and limited education—to be demonstrated later—to be considered for full-time gainful employment. Of those examined 1,458 (77.9%) were under the age of 60. In partial explanation of the size of this segment of the public assistance caseload, it must be pointed out that these oldsters bespeak the social, cultural, and economic patterns of 50 to 60 years ago. Education was limited for everyone, the financial potential of young persons growing up was highly restricted, and the paucity of some of our now to-be-taken-for-granted social phenomena was extreme. This under-60 age group, in great part, is a product of these underprivileged days in the history of Oklahoma.

Table I—Case Status of WEC Examinees

Status	Number	%
Clients applying for assistance	335	17.7
Clients applying for continuation of assistance	239	11.9
Clients currently receiving assistance, but reevaluation desired by MRT	586	29.3
Clients being reevaluated after prior examinations of WEC—both approved and disapproved applicants	163	8.1
Clients applying for assistance who were denied previously	677	33.9
Aggregate	2,000	99.9

Table II—WEC Examinees by Sex

Sex	Number	%
Male	1,567	78.3
Female	433	21.7
Aggregate	2,000	100.0

Table III—WEC Examinees Compared with Population of Oklahoma by Race

Race	WEC Examinees Number	%	State of Oklahoma* Number	%
White	1,684	84.2	2,146,851	90.9
Negro	222	11.1	159,934	6.8
Indian	92	4.6	53,769	2.3
Other	2	0.1	—	—
Aggregate	2,000	100.0	2,360,554	100.0

*1956 figures as estimated by the Oklahoma State Department of Health, based on 1950 census.

Table IV—WEC Examinees by Age

Age Group, Years	Number	%
18-29	63	3.2
30-39	192	9.6
40-49	453	22.6
50-59	850	42.5
60-69	439	21.9
70 and over	3	0.1
Aggregate	2,000	99.9

The state's characteristic occupational emphasis is seen in Table V, where the totals are high for the kind of work which typified Oklahoma prior to World War II.

Not expected is the 61% total of unskilled, labor, and farm labor groups (1,232) in light of the farming manpower needs of premechanization days, when most of these applicants were not permitted by their families to complete school but were withdrawn to help with the crops.

The marital status is delineated in Table VI. Unlike some of the European countries of low economic security, where a high percentage of the men remain single or marry late, in Oklahoma 1,813, or 90.6% of this sample of those needing assistance and allegedly disabled, had married.

A previous study conducted by the Oklahoma Department of Public Welfare[6] showed that in November, 1953, there were 38,403 children receiving ADC, and included in the breakdown of "status of father" there were 5,199 whose "paternal estrangement" was classified as "unwed."

Cause of Alleged Disability—An analysis was made of the disability of the persons in the study, and this is shown in Table VII.

Table V—WEC Examinees by Occupation

Occupation	Number	%
Farm labor	740	37
Labor	386	19
Housewife	297	15
Semiskilled	201	10
Crafts	111	6
Unskilled	106	5
Others	159	8
Aggregate	2,000	100

Table VI—WEC Examinees by Marital Status

Marital Status	Number	%
Married	1,372	68.6
Widowed	288	14.4
Single	156	7.8
Divorced	102	5.1
Separated	51	2.5
Not known	31	1.6
Aggregate	2,000	100.0

Table VII—WEC Examinees by Etiology of Disability (Alleged or Actual)

Etiology	Number	%
Disease process	1,709	85.5
Injuries	233	11.6
Surgical procedure	11	0.5
Compensable work injury	10	0.5
Military service injury	4	0.2
Congenital conditions	3	0.2
Not known	30	1.5
Aggregate	2,000	100.0

The inclusion of the category "surgical procedure" in the classification used in Table VII is based on the residual disabling effects of certain operative events. Obviously, most of the patients possessed conditions relating to disease processes, and it was surprising to see that only 11.6% could be causally connected with trauma or accidental happening. Of the 233 applicants whose disability emanated from an injury, 104 (44.6%) presented causes of disability which impressed several of the examiners. In many instances, a relatively minor trauma has caused a permanent disability, as perceived by the applicant. For example, a 46-year-old man was saddling a horse about 12 years prior to his examination in the WEC, when the saddle for one reason or another did not hit the objective, and landed on the ground rather than on his horse. This "threw" the man, causing pain in the back for which he received no medical attention, and he was inactive for two days only. This minor injury, however

Table VIII—WEC Examinees by Primary Diagnosis as Made by Previous Examiners

Order of Frequency	Diagnosis	Number	%
1	Gastrointestinal disorders	286	14.3
2	Cardiac disorders	275	13.7
3	Arthritides	212	10.6
4	Orthopedic disorders	193	9.6
5	Pulmonary diseases	154	7.7
6	Psychiatric disorders	137	6.9
7	Vascular disorders	118	5.9
8	Genitourinary disorders	84	4.2
9	Diabetes mellitus	56	2.8
10	Eye conditions and visual disorders	51	2.5
11	Neoplastic disease, benign and malignant	49	2.5
12	Allergic states	46	2.3
13	Obesity	45	2.3
14	Hernia	40	2.0
15	Endocrine disorders	38	1.9
16	Blood disorders	28	1.4
17	Convulsive disorders	25	1.2
18	Others	163	8.2
	Aggregate	2,000	100.0

Table IX—WEC Examinees by Secondary Diagnosis as Made by Previous Examiners

Order of Frequency	Diagnosis	Number	%
1	Gastrointestinal disorders	253	12.6
2	Arthritides	218	10.9
3	Cardiac disorders	199	9.9
4	Orthopedic disorders	162	8.1
5	Psychiatric disorders	150	7.5
6	Vascular disorders	150	7.5
7	Pulmonary diseases	147	7.3
8	Genitourinary disorders	110	5.5
9	No secondary diagnosis	99	5.0
10	Hernia	52	2.6
11	Eye conditions and visual disorders	38	1.9
12	Allergic states	37	1.9
13	Neoplastic diseases, benign and malignant	37	1.9
14	Endocrine disorders	36	1.8
15	Diabetes mellitus	35	1.8
16	Obesity	33	1.7
17	"Weakness"*	31	1.5
18	Blood disorders	29	1.4
19	Skin diseases	25	1.2
20	Mental deficiency	18	0.9
21	Others	141	7.1
	Aggregate	2,000	100.0

*In some instances, previous examiners had provided a symptom rather than a definitive diagnosis.

—as, indeed, there were no pathologic changes in the back—was of sufficient severity to him to preclude his working for this prolonged period.

Physical Findings Before WEC Examination—As mentioned previously, all of the 2,000 examinees were studied by practitioners or clinics elsewhere, prior to their referral to the WEC. The diagnoses made on these applicants were forwarded to the WEC in their original wording as provided by the examining physicians. In some instances, the diagnostic terms were actually symptoms, e.g., "shortness of breath," "weakness," and "underweight." In a group of applicants who had been injured there was no identification of the nature of the injury—"injury" being the sole diagnostic term used. There were 20 of the 2,000 for whom no diagnosis had been made, and these are included among "others." On classifying the diagnoses made by the previous examining physicians, the most important finding and the next most important finding were labeled primary and secondary,* and it is these diagnoses that have been used to compare the findings of the WEC with those of the previous examiners. A code for the diagnoses was established and used with 99 different nosologic entities, but this has

*This classification was required by the DPW for statistical purposes.

been consolidated to a shorter list of 38. The primary diagnoses as encountered and tabulated from the examination reports of the previous examiners are shown in Table VIII.

The condition encountered in greatest number by the previous examiners was, as seen in Table VIII, gastrointestinal disorders, 14.3%, with cardiac disorders second at 13.7%, and the arthritides in third position with 10.6%. These three represent a total of 38.6% of the aggregate. The secondary diagnoses (second most important diagnoses) made by previous examiners included the same three classification groups, but showed a slight alteration in order. Highest was gastrointestinal disorders at 12.6%, the arthritides were second with 10.9%, and cardiac disorders in the third position at 9.9%. These three totaled, in the secondary diagnosis classification, 33.4%.

Physical Findings Made by WEC Examiners —In Tables X and XI are demonstrated the form of primary and secondary diagnoses as made by the WEC examining physicians. The poorly defined terms of "injury, unidentified," "none stated," "shortness of breath," and "weakness" do not appear.

Of interest is the inclusion for the first time of the diagnosis "normal person" among the examinees. This group of four, even though they were applying for public assistance on the basis of alleged disability, had no abnormal physical findings of any kind.

In Table XI, there is the entity, ninth in sequence, of "no secondary diagnosis," for 81 persons. This implies that these examinees had one diagnosis made only and this obviously was the primary diagnosis. Outstanding, of course, on first scanning, is the fact that the leading diagnosis made by the WEC examiners both as a primary diagnosis and a secondary diagnosis was psychiatric disorders. Of the 2,000 examinees, 469 (23.45%) were considered by the

Table X—WEC Examinees by Primary Diagnosis as Made by WEC Examiners

Order of Frequency	Diagnosis	Number	%
1	Psychiatric disorders	469	23.45
2	Cardiac disorders	253	12.65
3	Arthritides	141	7.05
4	Pulmonary diseases	138	6.90
5	Orthopedic disorders	131	6.55
6	Gastrointestinal disorders	118	5.90
7	Vascular disorders	94	4.70
8	Obesity	76	3.80
9	Allergic states	65	3.25
10	Poor motivation	53	2.65
11	Genitourinary disorders	50	2.50
12	Mental deficiency	48	2.40
13	Diabetes mellitus	43	2.15
14	Convulsion disorders	36	1.80
15	Eye conditions and visual disorders	32	1.60
16	Neuromuscular disorders	30	1.50
17	Neoplastic disorders, benign and malignant	29	1.45
18	Endocrine disorders	29	1.45
19	Hernia	20	1.00
20	Hemiplegia	19	0.95
21	Ear disorders and hearing impairment	18	0.90
22	Skin diseases	18	0.90
23	Blood disorders	14	0.70
24	Amputations	14	0.70
25	Syphilis	12	0.60
26	Underweight	12	0.60
27	Dental and oral conditions	10	0.50
28	Addictions	8	0.40
29	Congenital anomalies	8	0.40
30	Nose and throat conditions, NOC	5	0.25
31	Normal person	4	0.20
32	Infectious diseases	2	0.10
33	Occupational poisoning	1	0.05
	Aggregate	2,000	100.00

Table XI—WEC Examinees by Secondary Diagnosis as Made by WEC Examiners

Order of Frequency	Diagnosis	Number	%
1	Psychiatric disorders	264	13.20
2	Arthritides	218	10.90
3	Vascular diseases	163	8.15
4	Pulmonary diseases	157	7.85
5	Gastrointestinal disorders	138	6.90
6	Orthopedic disorders	134	6.70
7	Cardiac disorders	105	5.25
8	Genitourinary disorders	81	4.05
9	No secondary diagnosis	81	4.05
10	Obesity	80	4.00
11	Eye conditions and visual disorders	71	3.55
12	Dental and oral conditions	69	3.45
13	Poor motivation	52	2.60
14	Endocrine disorders	47	2.35
15	Hernia	47	2.35
16	Mental deficiency	37	1.85
17	Diabetes mellitus	30	1.50
18	Allergic states	28	1.40
19	Neoplastic diseases, benign and malignant	24	1.20
20	Skin diseases	24	1.20
21	Hemiplegia	23	1.15
22	Ear disorders and hearing impairment	20	1.00
23	Underweight	20	1.00
24	Blood disorders	18	0.90
25	Nose and throat conditions, NOC	15	0.75
26	Neuromuscular disorders	14	0.70
27	Syphilis	10	0.50
28	Amputations	9	0.45
29	Convulsive disorders	7	0.35
30	Addictions	6	0.30
31	Congenital anomalies	4	0.20
32	Infectious diseases	2	0.10
33	Speech defect	2	0.10
	Aggregate	2,000	100.00

examiners to have a psychiatric condition as the primary difficulty encountered, and in 264 (13.20%) the same entity served as a secondary diagnosis. It is quite possible, of course, that this latter number of 264 includes some of those on whom the primary diagnosis of psychiatric disorders is made, for in a certain number of applicants the two leading diagnoses were both within the area of psychiatric illness. Second as a primary diagnosis in the WEC was cardiac disorders—263 (12.65%), whereas the arthritides were second in the listing of secondary diagnoses at 218 (10.90%). The arthritides comprise the primary diagnosis in 141 (7.05%) (third place) and vascular diseases were in the number three position in secondary diagnoses at 163 (8.15%). The three clinical categories combined totaled as primary diagnoses 43.15% of the aggregate and as secondary diagnoses, 32.25%.

Differences in Examination Findings— In order to demonstrate more specifically the differences in diagnostic yield by the two groups of examiners, it is necessary to compare the diagnoses made as differences in percentage values.

Table XII shows the number of times that a diagnosis was made as the primary diagnosis, and Table XIII demonstrates the same in regard to secondary diagnoses. Outstanding is the figure +16.60%, psychiatric disorders, the leading diagnosis made by WEC examiners as the primary condition of significance. The same cate-

Table XII—WEC Examinees by Diagnostic Yield Showing Comparison of Primary Diagnoses Made by Previous Examiners and WEC Examiners

Primary Diagnosis	Incidence of Primary Diagnosis as Made by Previous Examiners	Incidence of Primary Diagnosis as Made by WEC Examiners	Percentage of Examinees with Primary Diagnosis as Made by Previous Examiners	Percentage of Examinees with Primary Diagnosis as Made by WEC Examiners	Changes in Incidence of Primary Diagnosis as Made by WEC Examiners as Compared with Previous Examiners
Psychiatric disorders	137	469	6.85	23.45	+16.60%*
Poor motivation	3	53	.15	2.65	+2.50*
Mental deficiency	9	48	.45	2.40	+1.95*
Obesity	45	76	2.25	3.80	+1.55*
Allergic states	46	65	2.30	3.25	+0.95*
Neuromuscular disorders	18	30	.90	1.50	+0.60*
Convulsive disorders	25	36	1.25	1.80	+0.55*
Hemiplegia	10	19	.50	.95	+0.45*
Underweight	4	12	.20	.60	+0.40*
Addictions	1	8	.05	.40	+0.35*
Dental and oral conditions	4	10	.20	.50	+0.30*
Normal person	0	4	.00	.20	+0.20*
Congenital anomalies	5	8	.25	.40	+0.15
Amputations	11	14	.55	.70	+0.15
Ear disorders and hearing impairment	15	18	.75	.90	+0.15
Occupational poisoning	0	1	.00	.05	+0.05
Skin diseases	19	18	.95	.90	—0.05
Infectious diseases	4	2	.20	.10	—0.10
Syphilis	14	12	.70	.60	—0.10
Nose and throat conditions, NOC	8	5	.40	.25	—0.15
"Shortness of breath"	4	0	.20	.00	—0.20*
Endocrine disorders	38	29	1.90	1.45	—0.45*
Diabetes mellitus	56	43	2.80	2.15	—0.65*
Blood disorders	28	14	1.40	.70	—0.70*
"Injuries, unidentified"	14	0	.70	.00	—0.70*
Pulmonary diseases	154	138	7.70	6.90	—0.80*
Eye conditions and visual disorders	51	32	2.55	1.60	—0.95*
Hernia	40	20	2.00	1.00	—1.00*
Neoplastic disease, benign and malignant	49	29	2.45	1.45	—1.00*
"None stated"	20	0	1.00	.00	—1.00*
Cardiac disorders	275	253	13.75	12.65	—1.10*
Vascular disorders	118	94	5.90	4.70	—1.20*
Genitourinary disorders	84	50	4.20	2.50	—1.70*
Orthopedic disorders	193	131	9.65	6.55	—3.10*
Arthritides	212	141	10.60	7.05	—3.55*
Gastrointestinal disorders	286	118	14.30	5.90	—8.40*

*These changes in incidence of diagnoses are considered significantly different by interpolation from 99% Confidence Interval Tables, in Snedecor, G. W.: Statistical Methods, Ed. 5, Ames, Iowa, The Iowa State College Press, 1956, p. 5.

gory, psychiatric disorders, led the list of secondary diagnoses at +5.70%. These figures indicate that this particular diagnosis was made in 16.60% more of the applications than had been done by the group of previous examiners. The same holds true for the greater number of such diagnoses being made as secondary diagnoses and Table XIII points out that psychiatric disorders was the leading secondary diagnosis in 5.70% more of the applicants examined. Following closely are the diagnoses of poor motivation, mental deficiency, and obesity—all of which are entities logically belonging to "psyciatric disorders," but are identified individually for illustrative purposes.

This difference in examination product provides not only a different view of the person being examined, but also sugests that there is a different orientation to—a different understanding of—the person being evaluated for disability or for work capacity. In a medical center where a comprehensive approach to the practice of medicine is emphasized, considerable weight is given to the psychiatric and social factors which would influence diagnoses. Because of this, many of the applicants diagnosed as having gastrointestinal disorders by the previous examiners, will be diagnosed as having psychophysiologic gastrointestinal reactions by the WEC examiners. The most striking difference, of course, is the number of times that the diagnosis of poor motivation was made by the WEC examining team, i.e., 53 times as the primary diagnosis, as compared with three

Table XIII—WEC Examinees by Diagnostic Yield Showing Comparison of Secondary Diagnoses Made by Previous Examiners and WEC Examiners

Secondary Diagnosis	Incidence of Secondary Diagnosis as Made by Previous Examiners	Incidence of Secondary Diagnosis as Made by Previous Examiners	Percentage of Examinees with Secondary Diagnosis as Made by Previous Examiners	Percentage of Examinees with Secondary Diagnosis as Made by WEC Examiners	Changes in Incidence of Secondary Diagnosis as Made by WEC Examiners as Compared with Previous Examiners
Psychiatric disorders	150	264	7.50	13.20	+5.70% *
Dental and oral conditions	6	69	.30	3.45	+3.15*
Poor motivation	3	52	.15	2.60	+2.45*
Obesity	33	80	1.65	4.00	+2.35*
Eye conditions and visual disorders	38	71	1.90	3.55	+1.65*
Mental deficiency	18	37	.90	1.85	+0.95*
Vascular disorders	150	163	7.50	8.15	+0.65*
Endocrine disorders	36	47	1.80	2.35	+0.55*
Hemiplegia	13	23	.65	1.15	+0.50*
Pulmonary diseases	147	157	7.35	7.85	+0.50*
Underweight	11	20	.55	1.00	+0.45*
Amputations	6	9	.30	.45	+0.15*
Ear disorders and hearing impairment	17	20	.85	1.00	+0.15
Congenital anomalies	2	4	.10	.20	+0.10
Syphilis	8	10	.40	.50	+0.10
Arthritides	218	218	10.90	10.90	no change
Addictions	5	6	.25	.30	—0.05
"None stated"	1	0	.05	.00	—0.05
Nose and throat conditions, NOC	16	15	.80	.75	—0.05
Skin diseases	25	24	1.25	1.20	—0.05
Infectious diseases	4	2	.20	.10	—0.10
"Injuries, unidentified"	2	0	.10	.00	—0.10
Speech defect	4	2	.20	.10	—0.10
Neuromuscular disorders	18	14	.90	.70	—0.20
Diabetes mellitus	35	30	1.75	1.50	—0.25
Hernia	52	47	2.60	2.35	—0.25
Allergic states	37	28	1.85	1.40	—0.45*
Convulsive disorders	16	7	.80	.35	—0.45*
"Shortness of breath"	9	0	.45	.00	—0.45*
Blood disorders	29	18	1.45	.90	—0.55*
Neoplastic disease, benign and malignant	37	24	1.85	1.20	—0.65*
Normal person	99	81	4.95	4.05	—0.90*
Genitourinary disorders	110	81	5.50	4.05	—1.45*
Orthopedic disorders	162	134	8.10	6.70	—1.50*
"Weakness"	31	0	1.55	.00	—1.55*
Cardiac disorders	199	105	9.95	5.25	—4.70*
Gastrointestinal disorders	253	138	12.65	6.90	—5.75*

*See footnote Table 12.

times as made by the previous examiners. When considered as a secondary diagnosis, the total of applicants given poor motivation as the diagnosis was 52, in comparison with 3 made by the original examiners. There seems to be a greater inclination to identify the dynamics of behavior as related to alleged disability by the Medical Center examiners than is done by those away from the University. An essentially neutral zone is seen for a great number of the conditions delineated, meaning that in these there was not too remarkable a difference in opinion. The WEC physicians made such diagnoses as cardiac disorders, gastrointestinal disorders, arthritides, and orthopedic disorders much less frequently than did the original examiners. As stated previously, no diagnoses were made by the WEC examiners comparable to the fringe entities of "weakness," "none stated," "injuries unidentified," or "shortness of breath." To be sure, many of these differences can be explained by the availability of specific diagnostic test procedures such as electroencephalography, electrocardiography, diagnostic radiography, audiometry, serologic tests for syphilis, and diagnostic hematologic procedures.

Work Capacity Evaluation—The core of the whole effort of the Work Evaluation Clinic is the actual evaluation made by its examiners. The recommendations made by previous examiners are seen in Table XIV. The significant figures are the ones provided by the examiners, which without qualification, showed that 212 persons, in their estimation, or 10.6%, were able to work, and 1,052, or 52.6%, were disabled for work. If all of the examinees who were evaluated as being disabled for work but

Table XIV—WEC Examinees by Evaluation of Previous Examiners

Evaluation	No. of Applicants		Percentage	
	Subgroup	Major Group	Subgroup	Major Group
Able to work	212		10.60	
Able to work with special placement	186		9.30	
Advise medical or surgical care, then able to work	165	566	8.25	28.3
Able to do light work	3		0.15	
Disabled for work	1,052		52.60	
Disabled for work and advise medical care	103		5.15	
Advise reevaluation in 1 month	96		4.80	
Advise reevaluation in 3 months	56	1,338	2.80	66.9
Advise reevaluation in 6 months	23		1.15	
Advise reevaluation in 12 months	8		0.40	
Advise rehabiiitation referral	58	58	2.90	2.9
No recommendation made	38	38	1.90	1.9
Aggregate	2,000		100.00	
Aggregate by major groupings		2,000		100.0

Table XV—WEC Examinees by Evaluation of WEC Examiners

Evaluation	No. of Applicants		Percentage	
	Subgroup	Major Group	Subgroup	Major Group
Able to work	662		33.10	
Able to work	220		11.00	
Able to work but advise medical care	155		7.75	
Advise medical or surgical care, then able to work	21	1,058	1.05	52.9
Able to do light work	0		0.00	
Disabled for work	491		24.55	
Disabled for work, and advise medical care	75		3.75	
Disabled for work, recommend hospitalization	14		0.70	
Advise reevaluation in 1 month	3		0.15	
Advise reevaluation in 3 months	59	806	2.95	40.3
Advise reevaluation in 4 months	19		0.95	
Advise reevaluation in 6 months	66		3.30	
Advise reevaluation in 12 months	77		3.85	
Advise reevaluation in 6 weeks	2		0.10	
Advise rehabilitation referral	132	132	6.60	6.6
Physical examination refused, no recommendation made	4	4	0.20	0.2
Aggregate	2,000		100.00	
Aggregate by major groupings		2,000		100.0

Table XVI—WEC Examinees by Comparison of Recommendations Made by Previous Examiners and by WEC Examiners

Evaluation	By Previous Examiners No.	%	By WEC Examiners No.	%	Changes in Evaluation as Made by WEC Examiners as Compared with Previous Examiners	%
Able to work	566	28.3	1,058	52.9	+492	+24.6
Disabled for work	1,338	66.9	806	40.3	—532	—26.6
Advise DVR* referral	58	2.9	132	6.6	+74	+3.7
No recommendation	38	1.9	0	0.0	—38	—1.9
P. E. refused, no recommendation	0	0.0	4	0.2	+4	+0.2
Aggregate	2,000	100.0	2,000	100.0		

*Division of Vocational Rehabilitation.

could work with medical care, surgical correction, special placement, etc., were totaled, then the total number able to work would increase to 566, or 28.3% able to work. If the total number deemed disabled for work had added to it the groups of those disabled but in need of medical care, etc., the number would increase to 1,338 (66.9%), leaving only 4.8% not otherwise classified.

The evaluations made by the Work Evaluation Clinic will be found in Table XV. When Table XV is grouped in the same manner, it is found that, without qualification, 662 were able to work, or 33.1%, and 491 or 24.55% were considered disabled for employment. When all the groups are added (apart from those recommended for rehabilitation referral and those refusing examination), then the total considered capable for work was 1,058 or 52.9%, and those believed unable to work, 806, or 40.3%. Table XVI compares the recommendations made by the two examining groups.

From Table XVI one learns of the differences resulting from the reexamination of the AD and ADC applicants by the WEC. The WEC believed that 492 more persons, or 24.60% additional, could work than were considered so by the previous examiners. Likewise, 532 fewer persons (–26.60%) were deemed disabled for work by the WEC than were so evaluated by the previous examiners. Of noticeable difference also, was the number of clients recommended for referral to the State Division of Vocational Rehabilitation—the WEC advised such action on 74 more than the first examiners.

Acceptance or Rejection of WEC Recommendations—Before one can translate these figures into savings for the State of Oklahoma, one must determine whether the recommendations made by the WEC examining team were approved by the medical review team. It must be remembered—as stated previously—that the medical findings comprise but one segment of evidence in the determination of work capacity, other elements being brought in for weighing by the MRT. In Table XVII, there are shown the acceptance and rejection of the WEC recommendations.

It might be assumed that the 160 persons shown in Table XVII, those whose WEC recommendations were rejected, were applicants considered by the WEC as being able to work, but conversations with the DPW did not affirm this completely. To follow this group further, to

Table XVII—Acceptance or Rejection of WEC Recommendations by Medical Review Team

Action Taken by MRT	No. of Examinees	%
Recommendation accepted	1,803	90.15
Recommendation rejected	160	8.00
No action*	37	1.85
Aggregate	2,000	100.00

*Case closed without action—client moved, died, etc.

Table XVIII—WEC Examinees Whose Evaluations Were Reversed by MRT—by Subsequent Action

Examinees on Whom Decision Reversed by MRT	Approved for Public Assistance (AD or ADC) by Subsequent "Outside" Examination		Not Approved for Public Assistance (AD or ADC) by Subsequent "Outside" Examination		Not Known	
	No.	%	No.	%	No.	%
160	33	20.6	116	72.5	11	6.9

Table XIX—Appeals by Applicants "Able to Work" Recommendations by WEC

No. of Appeals Made by Applicants Considered by WEC as "Able to Work"	WEC Evaluations Upheld		WEC Evaluations Reversed	
	No.	%	No.	%
99	52	51.2	47	47.5

learn of additional action taken, inquiry was made whether any of these persons were subsequently approved for public assistance by additional "outside" examination. The results of this procedure are shown in Table XVIII.

The original recommendation acceptance figure of 1,803 (Table XVII) can be increased, therefore, to 1,919, or an ultimate acceptance rate of 95.95%. The actual number, corrected, of persons considered able to work, as adjudged by the WEC becomes, then, 1,015 or 449 greater than the number of applicants deemed able to work by the initial examiners.

Appeals by WEC-Rejected Applicants—The person applying for AD or ADC has the right of appeal, and it is of interest to learn of the decisions by the appeals board (composed of nonmedical personnel) regarding the evaluations made by the WEC. Table XIX shows the action resulting from appeal.

Appeals were made by only 99 persons of a total group of 1,058 deemed by the WEC as "able to work," or 9.3%. One wonders why the appeal rate was so low. One can postulate that these persons are averbal and will not contest a decision. Were the same group to be considered "able to work" in states such as Pennsylvania, New York, Michigan, or California, it is likely that the number of appeals would increase, for the people in these areas are less inclined to accept official decision without spirited discussion and complaint. Further, it is quite likely that many of the applicants whose requests for assistance were rejected are fatalistic in their view of the disapproval and would assume that this was "the way it should be." The matter of appeals was checked at one time during the course of operation of the WEC, and all of the appeals for the calendar year 1956 were reviewed. There were 166 appeals on the point of incapacity or disability.[17] After examination of these clients by the WEC, 33 had been denied by the MRT. Of these 33, 13 appeals were sustained, 17 were denied, 1 was dismissed for reapplication, 1 was withdrawn at the request of the client, and 1 decision was yet to be made. These figures were reassuring as points in quality control.

Another interpretation might be that the applicants, coming in from small towns in rural areas, see for the first time a university medical center with all its staff, its equipment, and its facilities and leave with the realization that every "scientific method has been utilized to evaluate their disability or capacity." They are personally convinced that everything has been done to reach the most valid conclusion with all of the means at hand. Hence, no appeal is in order.

Part III—Advantages of a Work Evaluation Clinic

It would be most appropriate to delinate the advantages of establishing a work evaluation unit in a medical center. It brings clients seeking aid into a single institution where full diagnostic facilities are available for application to the capacity evaluation. When a clinic of this type is a part of the total program of occupational medicine, it is given an experience background of inestimable worth in the determination of a man's ability to work. It is logical to utilize as examiners those physicians who are familiar with the demands of work and the kinds of job performance demonstrated by legions of physically limited employees. It is desirable that medical students have opportunities to test their abilities in judging the total man's will and health for work. Further, it offers an organized clinic created for the sole objective of work capacity analysis and does not utilize just another clinic for this purpose.

The perfect evaluation unit is one with case workers, psychologists, knowledgeable and flexible vocation counsellors who, along with dietitians and physical therapists, can join the physicians in creating an aggressive team aimed at the conservation and restoration of human resources for the complex industrial society that is ours. The allocation of some public welfare funds to establish and maintain this kind of imaginative installation may return more to the taxpayers than the contemporary evaluation methods are now doing.

This joint operation between a state department of public welfare and a university medical center has tasted of success, and might be the logical locus for the creation of a truly preventive medical activity, where marginal men can become productive persons and no longer have to occupy the position on society's back in which no pride is possible.

Crawford H. Greenewalt, President of E. I. du Pont deNemours & Company, formulated the concept well when he said: "That nation is strongest that provides whatever incentives are needed to make its people do their best. That nation is weakest that fails to utilize the tremendous power of self-interest. . . ."

Summary

1. To implement further the federal-state public assistance program in Oklahoma, a Work Evaluation Clinic was established at the University of Oklahoma Medical Center to conduct work capacity evaluations on applicants for aid to the disabled (AD), and aid to dependent children (ADC), in a cooperative

arrangement with the Oklahoma Department of Public Welfare.

2. The Work Evaluation Clinic (WEC) became an operating responsibility of the group at the Medical Center concerned with occupational medicine, and physical examinations were conducted by private practitioners interested in, and engaged in part, in industrial medicine, visiting on a part-time basis. The establishment at the Medical Center was believed desirable for the conducting of evaluation on applicants who had been reviewed once or twice previously by other examiners and on whom a second or third opinion or a solution to a complex diagnostic problem was desired.

3. The date of activation of the program was Feb. 19, 1954, and in four years approximately 2,700 work capacity evaluations have been conducted, of which 2,000 are analyzed in detail.

4. The clients examined consisted of those making initial application, those reapplying for continuation of assistance, or those on whom the medical review team (MRT) desired re-evaluation.

5. Of the 2,000 applicants, 917 related to the AD program and 1,083 to ADC. There were 1,567 (78.4%) men and 433 21.7%) women.

6. By race there were 1,684 (84.2%) white, with 222 (11.1%) Negro, 92 (4.6%) Indian, and two classified as other (0.1%).

7. In the age group of 18 to 50 years, there were 608 applicants, and the largest individual decade studied was that of age 50-59, with 850 persons, with 77.9% of the clients under age 60.

8. By occupation, farm labor accounted for 740 (37%) of the 2,000, and on grouping farm labor, labor, and unskilled, there were 1,232 persons (61%).

9. Maritally, 68.6% currently were married, 14.4% were widowed, 7.8% were single, 7.6% were divorced or separated, and no information was had for the remaining 1.6%.

10. As to the cause of disability, the breakdown was as follows: disease 85.5%, injury 11.6%, and miscellaneous 2.9%.

11. Employing a 38-category diagnostic classification, the diagnoses (primary and secondary) made by previous examiners and WEC examiners were studied. Previous examiners found gastrointestinal disorders in greatest number (14.3%), with cardiac disorders second at 13.7%, and the arthritides in third place with 10.6%, as primary diagnoses. In the secondary diagnostic classification, previous examiners encountered gastrointestinal disorders in greatest number (12.6%), with arthritides second at 10.9%, and cardiac disorders in third place with 9.9%. These totals, in the primary diagnostic classification, were 38.6%, and as a secondary diagnosis, 33.4%.

12. The leading primary diagnosis (and secondary also) made by the WEC examiners was psychiatric disorders at 23.45% (469), primary, and 13.20% (264), secondary. Cardiac disorders was second in the list of primary diagnoses, 253 (12.65%), while arthritides was second in the secondary diagnostic listing at 218 (10.90%). The third position in primary diagnoses was arthritides at 141 (7.05%), and vascular diseases was third in the secondary diagnostic classification at 163 (8.15%).

13. The greatest differences were encountered in the diagnosis of psychiatric disorder in that the change in incidence of diagnoses made by WEC examiners as compared with previous examiners was +16.6%, and in the secondary diagnostic classification was +5.70%. The greatest loss in comparing the incidence in diagnoses between previous examiners and WEC examiners was in gastrointestinal disorders at –8.40% (primary diagnosis) and –5.75% (secondary diagnosis). Differences in diagnostic classification and findings relate most probably to the psychiatric orientation of the examiners at the medical center.

14. Previous examiners found 566 persons able to work, or 28.3%, and 1,338, or 66.9%, disabled for work. This is in contrast to the WEC examiners, who encountered 1,058 able to work, or 52.9% (a change in incidence of +24.6%), and 806 disabled for work, or 40.3% (a change in incidence of - 26.6%). In essence, 492 more persons of the 2,000 were considered able to work by the WEC examiners. The MRT accepted the recommendation of the WEC examiners in 95.95% of the applicants.

Conclusions

1. The location of a work evaluation clinic in a university medical center is a logical procedure for a facility whose objective is the unbiased evaluation of work capacity.

2. A joint operation between a state department of public welfare and a university medical center (two state agencies) is a feasible and practical method of providing the welfare agency with capacity estimations fully utilizable for the approval or disapproval of applications for public assistance.

3. The presence of a WEC in a medical center allows both the teaching staff and the medical students to become aware of the procedures required for the appraisal of disability, the social factors responsible for personal disorganization, and the need for compulsory education in order to obviate an increase of the public assistance caseload. The presence of spe-

cialists and specialty clinics, plus the availability of highly technical and costly diagnostic facilities—although an outpatient department system will lengthen the time required for the reporting of findings—makes possible the holistic evaluation of the applicant.

4. It is recommended that state departments of public welfare explore the possibility of the establishment of comparable units in the university medical centers adjacent to them, where excellent facilities for evaluation are readily available.

Acknowledgment

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Dr. Felton's address is Department of Preventive Medicine and Public Health, University of California Medical Center, Los Angeles 24.

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Modern Rehabilitation— An Industrial Physician's Appraisal

D. John Lauer, M.D., Pittsburgh, Pennsylvania

FROM MY OWN observations in industry during the past 16 years, I have come to regard those men and women who have brought about the great miracle of rehabilitation as having a unique talent—the ability to create in their patients that very necessary idea and feeling that they can do the impossible. The apparatus, the modalities, the physical facilities seem to be mainly props for backdrop scenery in the drama of rehabilitation. Of real significance, however, is the changing role of the physician in the evolution of modern occupational medicine.

Physicians have been interested in the working man and the effects of his environment off and on for many centuries. But it was not until the early decades of this century that we in the United States manifested any real interest in the effects of work and the work environment on the employee, and then the principal concern was that of accidental injury. With the advent of the workmen's compensation laws, interest quickened and methods for the surgical repair of trauma increased. The first genuine preventive measures to reduce the incidence and severity of accidents took form in the safety movement which was spearheaded largely by the engineer. A phenomenal change was brought about in industry.[1]

The physician made some small contribution to this improved condition. At first it was from a negative position, since he acted mainly as an instrument for screening out workmen with physical impairments. In more recent years a more positive approach has evolved. He now has become part of a selective job placement group utilizing ways to fit the abilities of the individual workman to jobs rather than exhibiting undue concern about disabilities.

Industrial medicine received a great push forward during World War II. When all available manpower became needed, when shifts were lengthened, when new materials and processes were encountered daily, absence from work was a matter of vital concern. The physician, in order to carry out his role properly, virtually had to move into and become part of the industrial setting. When he did this, he began to learn many things firsthand, especially about the working environment and the workman's relationships to it. Where, as we have seen, the original emphasis was on the repair of trauma consistent with the requirements of workmen's compensation laws, there now began to appear a definite emphasis upon the positive aspects of health. It was logical, when one considers the success of the accident prevention program, to apply similar techniques to the prevention of occupational illness. The next step, of course, was to attempt to prevent illness of *non*occupational origin. All of this leads to the concept of occupational health as the maintenance of optimum health in the working population.

The objective of prevention is approached through improving the working environment on the one hand—which we know as industrial hygiene—and through health supervision of the individual worker on the other hand. The ultimate objectives of industrial medicine may be outlined in the following manner:

1. To fit the worker to the type and quantity of work commensurate with his ability to perform without injury to himself or to his fellow worker.
2. To maintain the health of the workman through individual medical supervision and education and through the prevention of occupational disease and injury by proper control of the work environment.

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Dr. Lauer is Medical Director, Jones & Laughlin Steel Corporation.

3. To restore to health and rehabilitate those workers who, in spite of the above efforts, suffer occupational disease or injury.[2]

4. To aid in restoring to employment the workman who suffers from non-work-connected injury or disease.

These objectives are met by a comprehensive medical program having the following components:

First, preventive measures consisting of the physical examination program for the placement of new employees and for periodically reexamining them either because of special reasons related to their work, or simply as a part of over-all health maintenance.

Second, health counseling and health education with referrals to private or public health agencies. Statistical and epidemiological methods can be adapted to the study of health records as a further aid along with the industrial hygiene and general engineering of environmental control measures. Here, research has excellent opportunities.

Third, definitive or curative treatment of occupationally induced injury or disease through the various means available. This combines first-aid treatment for nonoccupational illness and injury on the job with proper referral to the personal physician for subsequent care. It also includes, finally, rehabilitation.

A good definition of rehabilitation is this one: "The restoration of the handicapped to the fullest physical, mental, social, vocational and economic usefulness of which they are capable."[3] But we might add a line or two from Dr. Howard Rusk really to describe the modern day miracle: "That which happens between the bed and the job—the program that takes a man back to productivity to live the best life that he can with what is left."[4]

Barriers to Rehabilitation

In 1935 orthopedic surgeon Henry Kessler wrote:

> The history of social attitudes toward the disabled is harsh and brutal. The cripple has, since primitive times, been regarded as the work of the devil, or identified with malignancy and sin. The unwritten law of most primitive societies sacrificed the disabled, through death, or ostracism, for the good of the group. This idea was carried over into the written law of the ancients and determined the treatment of disabled persons for many centuries. The advent of Christianity struck a new note in the attitude toward the crippled and disabled. Destruction of life was declared to be sinful, and sympathy began to be shown to such persons. Not until centuries later, however, did this humane attitude really permeate the Church. And not until 1530 was the first feeble legislative provision made for the disabled, a law promulgated under Henry VIII permitting cripples to beg. In the eighteenth century came the first organized social interest in the disabled, directed primarily toward getting them off the streets by confining them. In the latter half of the nineteenth century limited attempts were finally made to apply the Christian tenets of charity and philanthropy. Despite wholesale reversions to the primitive attitude in recent totalitarian regimes, great progress has been made in the past 75 years. Nevertheless, psychosocial prejudice, reinforced by real or fancied economic considerations, is widespread. Social and economic discrimination against the handicapped is still common.[5]

In the generation that has passed since Dr. Kessler wrote this statement, there has been a continuing change in the public attitude, but we have by no means reached the millennium. It seems fair to say that one of the principal barriers against the employment of people with both physical and mental impairments is still mainly predicated on fear. "We got enough cripples of our own now," is a statement often heard. Yet the same foremen and supervisors will accept men referred by the physician for "light work," or "restricted work," when, in fact, their disabilities are such to make their job performance very sad indeed.

Let us bring into perspective the proportions of occupational injury and disease as they relate to industry and their amenability to rehabilitation. Occupational accidents account for only 5% of disability cases, with the remaining 95% accounted for as follows[6]: Chronic diseases, 88%; home, highway, and other accidents, 5%; congenital conditions, 2%. We might look at the efforts expended in restoring these 5% disability cases.

A report by the New York division of the Office of Vocational Rehabilitation during the fiscal year 1953-1954 indicates that 655 requests for lump-sum settlements of compensation cases involving permanent injury were made. In less than half of these—309—the patients had been or were being rehabilitated. The probable reasons for this relatively low percentage were given as follows:

1. Lack of motivation.
2. Ignorance or venality of doctors, lawyers, and workmen under present medical care provisions and claims procedures.
3. Lack of adequate authority for compensation boards to supervise medical care and failure by the boards to exercise what authority they have.
4. Lack of facilities for rehabilitation and shortage of trained personnel.[7]

Considering these four points, it is not hard to explain why it has been difficult to get this third phase of medicine—rehabilitation—out of the discussion stage.

Motivation

One can hardly reflect about motivation without thinking of Mr. Henry Viscardi, of Abilities, Inc., in Long Island. This unique company, conceived and launched in 1952 by Mr. Viscardi,[8] is virtually built on motivation—the motivation of the disabled. He himself was born with withered stumps for legs. The dramatic story of his life and how he overcame this impairment, literally turning it into an asset, is fascinating.

Along with four other "disabled" men and $8,000 of borrowed capital, Henry Viscardi leased a garage in central Long Island and began Abilities, Inc., a free-enterprise competitive industry whose only major difference from other companies is that it employs only people with marked physical disabilities. Perhaps the most important aspect they all have in common is an intense drive to take care of themselves in every way as any normal adult. This enterprise has grown constantly. In 1957 the company moved into a large, modern, new factory building, built from their earning or potential, in nearby Albertson, Long Island. Now, the employment rolls comprise over 300 persons.

Abilities, Inc., pays prevailing wages, offers incentive awards, and bids competitively for subcontracts in various aspects of the electronic assembly industry. Literally none of the more than 300 employees would be generally regarded as employable in most of our industries today, and particularly not as new employees.

Mr. Viscardi and his employment staff state frankly that not all disabled people are employable. Only about one in three who apply for work in their organization are hired. Only about one in three is really strongly motivated. Often the motivation to work may come from a well-meaning parent or spouse, social worker, physician, or nurse. That's not enough. The criterion for employment in their plant is psychological motivation rather than physical disability.

Recently Jones & Laughlin joined with two other industrial corporations and a rehabilitation center in a review study of our disabling injury and illness experiences. The goal is to test our current practices with a view toward reducing disability and increasing productiveness. Already we are recognizing certain truisms—that not all disabilities can be reversed or even prevented; that it is necessary to place more emphasis on the psychosocial aspects of all disability problems; that early rehabilitation on the job is usually adequate and desirable provided there is good understanding of the type of job to which the patient is going; and that energetic follow-up practices are required to prevent stagnation, discouragement, and fixing of a disability to a greater degree than necessary.

The rehabilitation literature abounds with pleas for early referral. Rusk is quoted as saying: "Early reference is the greatest problem we have in the rehabilitation program today. We get patients who have gone through a cycle just as real and just as definite as that in tertian malaria. The cycle runs through physical neglect, emotional trauma, and vocational sterilization."[7]

Mr. Stanwood Hanson, in describing why his company, The Liberty Mutual Insurance Company, pioneered a rehabilitation center in the workmen's compensation insurance field, states:

"Our claims department became aware of the fact that in the case of the seriously injured, the period of convalescence which followed the early stages of hospitalization and surgery was a time fraught with many hazards to ultimate recovery and return to employment. Often injured workers made excellent progress during the early stages of medical treatment or surgery but when the patient was discharged from the hospital and returned to his home to convalesce, *progress stopped.* This was often due to discouragement, fear of further injury or loss of confidence. Medical reports often reported the disability to be due to fixation of joints or atrophy of muscles as the result of disuse of body part."[9]

Litigation

One of the recognized barriers to early rehabilitation is the matter of secondary gain. This we might call the problem of litigation. There is inherent in most of the states' compensation laws a conflict in which the injured workman seemingly must choose between maximizing his injury to increase monetary compensation or minimizing his injury through rehabilitation or other restorative process at the expense of diminishing or terminating his compensation. In a word, it is somewhat difficult to retain the just compensation features without impairing motivation for rehabilitation. The conflict between compensation payments and medical care and rehabilitation will always be present as long as the primary emphasis of the compensation setup is upon monetary payments. The problem is now to minimize this conflict.

We are all well aware of the psychological trauma produced by litigation. At times this is one of the major barriers to early, satisfactory rehabilitation. I would say, categorically, that this is true among railroad workers. In a re-

cent study, Dr. Robert Halen[10] of our staff pointed this up rather strikingly.

The Province of Ontario is often credited with an outstanding workmen's compensation system. Morton Lane,[7] in his excellent monograph, states that whether the Ontario system is judged by the minute proportion of permanent disabilities to total injuries as compared with that in states of the United States, or by the benefits provided, or by the costs, the result is much the same, and hardly favorable to the American jurisidictions.

The Ontario Workmen's Compensation Board has apparently succeeded in convincing labor, industry, the medical profession, and the public generally that injured workmen receive good medical care and rehabilitation, that the Board is scrupulously fair in making awards. The crux of the matter seems to be that the primary emphasis is placed upon competent and adequate medical care and rehabilitation and that the workmen are not penalized when they are successful in rehabilitating themselves.

Lane suggests the following as factors in the reduction of litigation in Ontario:

1. The medical care and rehabilitation is of such a caliber that only 3.77% of all compensable injuries are permanent, whereas in New York the figure is between 35% and 40%.
2. In Ontario, 89 cents of every dollar paid by the employer for compensation purposes is expended either for medical care or for compensation benefits. In New York, only 53 cents of the premium dollar is applied to these purposes.
3. In 1954, the average rate of assessment on Ontario employers was 90 cents per $100 of assessable payroll. It is doubtful that any United States jurisdiction with comparable benefits can match this figure.

Curry, Hastings, Hatcher, and Ross[11] compare basic assessment rates* in Ontario, New York, and Michigan for 1953 as follows:

Industry	New York	Michigan	Ontario
Fabrication of structural iron and steel	$ 7.30	$ 2.01	$0.95
Lumbering	23.00	15.72	5.00
Manufacture of TV sets	1.50	1.48	.30

Many states have lump-sum settlement provisions in their workmen's compensation laws. There are a few good points in this respect. Usually the settlement on a lump-sum basis is at the discretion of the state compensation board. Administratively it may be desirable, but from the standpoint of the workman undergoing rehabilitation and correction of his disability, it is of dubious value. Before the settlement is made a workman does not wish to undergo rehabilitation for fear of jeopardizing the amount of settlement. After the settlement, the employer, or his insuranc carrier, is under no obligation to furnish any further care, since the case is closed.

Other factors that militate either for or against rehabilitation are matters dealing with the limitation in time and amount of medical care and compensation according to the law. Limited liability is really one of the inherent factors in a workmen's compensation system. There are occasional cases when this may work to the detriment of the injured workman and to society in general. Many companies have apparently recognized the difficulties inherent in such limitations and have not applied them. A number of states have written into their compensation law the requirement of the employer, or his insurance carrier, to provide hospital and medical services for a lifetime. Unless means of rehabilitation can be applied, costs on individual cases may run to $100,000 or more.

Facilities

As recently as 1954 the American College of Surgeons[12] approved a report of a subcommittee that compensation boards supervise all medical care to determine the accuracy of diagnosis and the competency of care and to assure that adequate medical and vocational rehabilitation are provided when necessary. They recommended the establishment of panels of impartial medical experts to aid the compensation boards. Many of us might hesitate to endorse with enthusiasm such a stringent recommendation, and yet the Ontario system virtually does just that.[13] Their medical care program is a highly integrated one, designed to minimize all injuries and to afford prompt and adequate rehabilitation. True working conditions are provided as part of the reconditioning program and facilities.

As physicians and surgeons, we are still in a phase where we are somewhat hesitant to call upon the techniques and personnel of rehabilitation. But as the demonstrated value of modern rehabilitation imposes its wonders upon us, such resistance will evaporate. The evolution will progress proportionately to the time we take to visit modern rehabilitation centers, to observe their work, to study their methods, to understand their philosophy, and to personalize it in practice.

There still exists, unfortunately, a paucity of rehabilitation centers in the United States. Such centers are not in competition with the physical medicine departments of our general hospitals. All general hospitals are eager to avoid the long stay occasioned by chronic disease or injury cases. It is becoming economic-

*All rates per $100 of payroll and, of course, in the United States definite limits on policy and loadings for extra hazards.

ally imperative that our hospitals reduce the long stay—the warehousing of the sick and the injured.

In the rehabilitation institutions, nursing care as practiced in the general hospital is reduced to almost the vanishing point. The nurse's duties are more like those of a teacher —a teacher to aid in readjusting the patient to the techniques of daily living, those things we do automatically in normal life which may have to be relearned. She teaches the patient to regain the ability to do things for himself again.

The successful rehabilitation of one injured workman is in itself a stimulating factor for the others. Success is the key to future successes. The competition of like groups of workmen living, playing, exercising, and working together often has the effect of reducing pain and fear. Confidence leads to restored muscle power and restored attitudes of happiness.

We all agree that it would be futile to attempt to make rehabilitation compulsory.

Placement

Two major objections are frequently put forward for refusing to hire handicapped workers. First, the impaired person represents a greater liability risk to the employer. Second, insurance rates are increased.

In an effort to overcome the first of these objections, the legislatures of many states have passed a second injury statute, which usually functions under the workmen's compensation law. Its purpose is to encourage the employment or reemployment of the handicapped. In principle, this is good; in practice, it does not always work out so well.

Generally, the first requirement for a case to come under the second injury statute is that the employee must have already had either the loss of or loss of use of limb or some other permanent physical impairment. Secondly, the employer must have been fully aware of this physical impairment. Thirdly, the permanent disability attributable to both the original and the second injury must be more serious than that caused by the second injury alone. There have been various legal interpretations read into these general requirements that have interfered with the good intentions of the code.

Second injury funds[14] lose effectiveness when there is a question of aggravation of a preexisting disease or defect for which compensation may or may not have been paid. Employment of persons with progressive disabilities—neuropsychiatric, cardiac, pulmonary diseases, arthritis, and deformities or anomalies of the spinal column—is particularly hampered.

The second major objection to hiring the impaired person frequently raised by employers is that an increase in insurance premiums would result. This would probably be true if there is no selectivity exercised in job placement.

The key to the hiring of new impaired workers is proper job placement. This cannot be too strongly emphasized. When it is carried out, there is an abundance of statistical evidence and reports to indicate that the physically impaired workman is as safe as or safer than his so-called normal counterpart. Trade unions[15] recognize the needs and values for such practices but at local levels are slow to allow them to be put into practice if interference with the seniority structure appears likely.

At a recent visit to Abilities, Inc., in Albertson, Long Island, I learned that in the first five years of their operation they had only one lost time workmen's compensation case and that was due to a hernia! In those five years Abilities, Inc., enjoyed a merit reduction in their compensation premium every year.

The National Association of Mutual Insurance Companies has declared:

> We have long been dedicated to the proposition that persons with physical handicaps are employable and that their employment is consistent with sound insurance principles. It would be inconceivable for an insurance company to advocate hiring the physically handicapped if more costly rates, more accidents and correspondingly larger premiums were to be the consequence.[16]

In the final consideration of the question, a handicapped person is not really handicapped if matched by ability to the job he is to do.

Summary and Conclusions

Rehabilitation is a multidisciplined and multifaceted aspect of health and disease. It has grown markedly in the past two generations. One can almost measure a civilization's progress by its willingness to restore the sick and the maimed.

Rehabilitation is not only economically sound today but is becoming an economic necessity. We all need to learn much more of the many cases amenable to rehabilitation; to know what consultation to seek, when to seek it, and how to use it, whether for physical or mental reasons or both.

The pressures of society, through law, are demanding better restoration, better medical care, better rehabilitation. We in the health professions must be alert to these demands—we must lead them into constructive areas and keep them economically feasible.

Those of us in industry whose primary concern is with the occupationally connected health problems of our working population must con-

stantly reexamine our methods and our attitudes toward rehabilitation. I believe all of us certainly need to do a more complete and effective job in the psychosocial area of rehabilitation.

We must counsel with the injured workman right from the start of his treatment by answering his fears and doubts, to tell him what is to be done for him on a program of medical treatment and rehabilitation, what he can reasonably expect and when; to tell him what compensations he will receive during his disability; and, if possible, to tell him what is planned for him upon his return to productive employment. If we could just place ourselves in his position, I think all the answers to the questions would readily present themselves.

Dr. Lauer's address is Jones & Laughlin Steel Corporation, 30 Gateway Center, Pittsburgh 30.

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Clues in Evaluating Physical Ability

Bert Hanman, Boston

THE PHYSICIAN, practicing in whatever branch of medicine, has always been concerned with the problem of how patients can best live and work with their physical and emotional shortcomings. As an introduction to this problem, the theory and methods used by physicians in evaluating physical ability were summarized in a recent paper.[1] The purpose now is to discuss application and clarify further how physical competence may be judged. With this knowledge a physician can point the way for his patients to both utilize and protect their remaining physical resources in seeking a more rewarding life of fuller and safer activity—whether workers or housewives, young or old, athletes or severely disabled persons.

While it is true that the medical profession to this day has concentrated almost solely on *dis*ease and *dis*ability and has done but little about the problems of *ability*, this situation should not cause concern when a need for determining physical fitness arises. Nor should it become an excuse for avoiding or neglecting or treating lightly the responsibility for safeguarding ability through proper appraisal and advice. For the determination of physical capacity can be as scientific as the science of medicine itself, and it can be done as artfully as the physician practices the art of medicine.

In the same manner as the physician uses science to track down various signs and symptoms of disease and disability, so should he pursue a variety of signs in the process of identifying ability. There are many clues to what a person can and cannot do with physical safety, and, as in diagnosing disability, the clues are both subjective and objective, with some being good and others misleading. The problem, as in medical practice generally, is largely one of avoiding the dangerous areas on one hand and of synthesizing the best available subjective and objective data on the other.

Mr. Hanman is Consultant, John Hancock Mutual Life Insurance Company; Member, World Health Organization Expert Advisory Panel on Social and Occupational Health.

The Diagnostic Workup

Perhaps the best way to *mis*judge both the strong and the weak points of a person's physical and emotional fiber is to follow the not uncommon practice of basing an opinion on the "halo effect" or general appearance of the person after a cursory examination. Indeed, a thorough medical history, physical examination and diagnostic workup are as basic to an understanding of a person's capacity for activity as they are to an interpretation of illness and incapacity. It is at this point that all of the objective tests and measurements of medical science can be as effective in defining physical assets as they are in identifying liabilities. Rather than "evaluating" or "appraising" ability, the approach should be to *diagnose* ability in the same sense as disability is diagnosed.

From the medical history and diagnosis, then, come the first and most basic series of clues—not only to disability but also to *ability*. For a given person, the clues will suggest certain physical activities and environmental hazards that the patient (*a*) should avoid completely, (*b*) could tolerate on a limited basis, and (*c*) could tolerate fully.

It is within the framework of this first tentative judgment that additional steps are taken to define these three broad categories more specifically. In taking these steps, a word of caution is needed, for there are at least five major areas of danger in which a faulty concept may lead to trouble unless corrected at the outset.

1. *Standardized Factors Versus Personal Notions About Physical Activities and Environmental Hazards*—The term physical ability is no more than an abstraction unless it is considered in relation to what a given person can and cannot do with physical safety. This means that one's knowledge of the actions and dangers it is possible for a human being to experience should be complete and accurate. But this is not often the case, since few persons, if any, ever experience all of the possible human activities and hazards. The general tendency is for one to prescribe for others within the limits of

his own personal recollections and thus to omit factors that are unimportant to him but which can be most important to others and vice versa.

To help avoid such errors and fill the gap between personal notions and reality, a list of 80 activities and hazards is shown is Figure 1. The list has been developed and thoroughly tested during the past 15 years in analyzing over 100,000 persons and 10,000 jobs plus other complex environmental situations. The list now represents practically all of the significant factors a human being may encounter in any environment at any time—whether industrial, commercial, recreational, social, domestic, or even military. Moreover, each factor has not only physical but also emotional significance, for a patient can have an emotional block to encountering any one of the factors regardless of his physical powers otherwise.

It is against such a complete background that the physician should begin to crystalize his thoughts about what activities and hazards the patient should avoid completely, could tolerate partially, and could tolerate fully. By keeping this list in mind the physician automatically considers both the action and the protection of his patients in all environments.

2. *Abilities Versus Disabilities*—A common fault in judging ability appears to be a desire to overprotect the patient, for, rather than thinking in terms of what the person can do, the emphasis is placed almost solely on disability and what he cannot do. It is an approach that is sometimes called "a list of negatives"—as in a recommendation for "No climbing. No heavy lifting. No car driving."

But the question of using protective negatives to safeguard the person's deficiencies involves only a part of the responsibility. Equally important is the positive role of determining and pointing out those activities in which the person is physically qualified to participate fully, as well as those in which he is partially competent. The total task is one of fully advising the patient what his strengths and weaknesses are for living and working *with* his physical defects—what he should do *to protect* and what he can do *to utilize* his remaining abilities to best advantage *around the clock.*

3. *Individuals Versus Groups*—The diagnosis of any patient automatically places him in a medical category and also immediately associates him in the mind of the physician with other persons having his disease or disability. In a doctor's thinking, then, there is a tendency for patient after patient to become members of a medical group of persons with coronary thrombosis or spinal arthritis or something else. And while this "group association" does make it possible for the physician to draw on a wide experience and prescribe the best available treatment for the patient's disability, on the other hand it often sets a psychological trap for the physician when it comes to evaluating the patient's physical assets.

The danger here lies in the tendency to assume that since disabled persons in any given disability group are alike in their disabilities, they are also alike in their remaining abilities —or that persons with similar disabilities can perform similar physical activities. This assumption naturally leads to concepts of fixed patterns of activity, to rigid classification systems, and to stereotyped job groupings for the persons in each disability group. For example, one frequent informal fixation is that of keeping in mind the jobs of janitor and watchman as being physically suitable for most disabled and older workers. The classic formal example of stereotyped job groupings is to be found in the 1,329 pages of a work prepared by the United States Civil Service Commission.[2]

But 100 persons with arrested tuberculosis do not have the same remaining abilities because they have scars on their lungs any more than 100 persons with dentures have the same physical competence because they have scars on their gums. Each person in any disability group has his own unique combination of residual abilities, which makes him very much of an individual instead of a group abstraction.

Hence, to follow stereotyped concepts frequently leads to adverse recommendations, however unintentional, and prevents some persons from performing domestic duties and holding jobs they very well could manage, as well as allowing other persons to engage in activities beyond the ranges of their abilities and thus cause physical harm. Instead, the problem should always be one of determining what the patient at hand can and cannot tolerate *as an individual,* with no special interest in what others may and may not be able to bear.

4. *Fitness Versus Unfitness*—Assuming occupational skill and interest, it is not easy to find a human specimen with the combined physical wherewithal to pilot a plane, to work in a steel mill, and to stand up under heavy construction work in all weather. Only about 1% of the population is fully capable of meeting the most arduous demands of work and life, while another comparatively small percentage is completely without any capacity for activity.[3, 4] The great mass of humanity is concurrently both partially fit and partially unfiit to meet the challenges of the outside world.

Hence, instead of the lingering notion that people are *either* fit *or* unfit on the basis of the

Profile of Physical Abilities

Blank Squares = No Restriction

O = No Ability

Written Numbers = Maximum Limits of Ability in Hours during { ☑ Waking Hours of 24-Hour Day / ☐ Working Hours of 8-Hour Day } Check One

NAME Mr. John Doe | AGE 57 | HEIGHT 5'8" | WEIGHT 163

PHYSICAL FACTORS:

	1	1 — 5 lbs.	Total Lifting Ability— Including Carrying and all Pushing and Pulling Effort
	2	6 — 10 lbs.	
2	3	11 — 25 lbs.	
1/2	4	26 — 50 lbs.	
1/4	5	51 — 75 lbs.	
0	6	76 — 100 lbs.	
	7	1 — 5 lbs.	Carrying Ability— *Carrying Ability means that portion of Total Lifting Ability which may be used in Carrying and in Pushing and Pulling while Walking*
	8	6 — 10 lbs.	
1	9	11 — 25 lbs.	
1/4	10	26 — 50 lbs.	
1/12	11	51 — 75 lbs.	
0	12	76 — 100 lbs.	
	13	Right	Fingering–Fine Dexterity
	14	Left	
	15	Right	Handling–Including Coarse Fingering
	16	Left	
	17	Right	Reaching: Below Shoulders
	18	Left	
1/4	19	Right	Reaching: Above Shoulders
1/4	20	Left	
1/6	21	Right	Hammering or Throwing
1/6	22	Left	
	23	Sitting	
12	24	Total Time on Feet	
12	25	Standing	
4	26	Walking	
0	27	Running	
0	28	Jumping	
@	29	Stairs or Ramps	Climbing
ⓑ	30	Ladders or Scaffolds	
	31	Right	Treading–Operating Foot Pedals: While Sitting
	32	Left	
4	33	Right	Treading–Operating Foot Pedals: While Standing
4	34	Left	
1	35	Stooping–Low-Back Bending	
1/3	36	Crouching–Knee Bending	
	37	Kneeling	
	38	Crawling	
	39	Reclining–Working Horizontally	
	40	Twisting–Spine	
	41	Waiting Time–Periods of Inactivity on Job	

20/	20	42	Far–Corrected Snellen — Vision
20/	20	43	Near–Corrected Snellen — Vision
		44	Color — Vision
		45	Depth — Vision
		46	Hearing
		47	Speaking
		48	_____ — Other Physical Factors
		49	_____ — Other Physical Factors

ENVIRONMENTAL FACTORS:

	50	Inside or Protected from Weather	
	51	Fair Weather	Outside Without Weather Protection
	52	Wet Weather	Outside Without Weather Protection
1/4	53	Hot	Due to Conditions Other than Weather
1/4	54	Cold	Due to Conditions Other than Weather
1/4	55	Sudden Temperature Changes	Due to Conditions Other than Weather
	56	Humid	Due to Conditions Other than Weather
	57	Dry	Due to Conditions Other than Weather
	58	Operating or Around Moving Vehicles or Objects	
	59	Hazardous Machinery	
	60	Sharp Tools or Materials	
	61	Cluttered Floors	
	62	Slippery Floors	
	63	High Places	
	64	Electrical Hazards	
	65	Exposure to Burns	
	66	Explosives	
	67	Radiant Energy (Kind): _____	
	68	Poor Lighting	
	69	Poor Ventilation	
	70	Toxic Conditions (Kind): _____	
	71	Wet Working Quarters	
	72	Close or Cramped Quarters	
	73	Vibration	
	74	Noise	
	75	Working With Others	
	76	Working Around Others	
	77	Working Alone	
	78	Rotating Shifts–*Zero if only day shift is suitable*	
O	79	95°F Summer Sun	Other Environmental Factors
O	80	0°F Winter Cold	Other Environmental Factors

REMARKS: @ 2 flights 15-20 steps an hour.
ⓑ 12 trips up 8-12 rung ladder a day.

DATE 9-13-58 PHYSICIAN S.S. Scott M.D.

Fig. 1—Sample profile of physical abilities.

medical examination, one should realize that practically everyone is simultaneously *both* fit and unfit regardless of what the examination reveals. The task is clearly one of determining the balance of the fitness and unfitness to be found in each person, and this in relation to the various activities of life and work shown in Figure 1.

5. *Objective Versus Subjective Terms*—With the activities and hazards the patient can tolerate fully, as well as with those he should avoid completely, the possibilities of a misunderstanding arising in communicating this opinion are slight, since the recommendation here will be made in the definite terms of "yes" and "no."

But the big problem remains and centers upon the question of how to prescribe for a person's participation in those activities for which he is only partially qualified—as for his partial ability to lift, stand, walk, and climb stairs. In this case a frequent answer to expect would be: "No heavy lifting. No prolonged walking and standing. No excessive climbing." Also, this same answer might be stated by others in more direct terms: "Only little to moderate lifting, standing, walking and climbing." Moreover, it would not be difficult to find instances where all of the factors have been rolled together into one blanket recommendation, such as "Light work only" or "Take it easy."

With any of these answers there is no denying that the physician has made a serious attempt to communicate his opinion. Each phrase probably holds deep personal meaning for the physician at the time, since he may well have a clear picture in his own mind of what he means, for example, by no "excessive" climbing for a given individual. Yet, what do these answers mean to patients, their families, and others? The fact is, within each of these phrases, and many others like them, there frequently lurks not only doubt but even disaster for the person. Each such phrase contains a highly charged subjective adjective or adverb, as in words like heavy, prolonged, excessive, moderate, light, and occasionally.

Hence, the good intentions of the physician and the meaning of his recommendations become easily distorted through the subjective interpretations of patients and others. This kind of distortion can and often does lead some patients to avoid personal duties and to be denied work they could easily perform with safety, as well as for other patients to pursue personal activities and be assigned work they should definitely avoid—thus resulting not only in personal and economic hardship for some victims but also in injury and illness and even death for others.

The modern trend among physicians is, therefore, to attempt to prevent these unintended tragedies by replacing the commonly used subjective terms with certain forms of objective expression that can be more consistently understood by everyone. The desired answers probably lie in the direction of the specific method—wherein a zero, pounds, hours, and other objective units are used by the physician to express his opinion on both the degree and the duration of what a person can and cannot do with safety, as illustrated in Figure 1. How a physician can readily master and use the quantitative units of the specific method is explained fully elsewhere in relation to a complete list of references.[1, 3, 4]

Recapitulation—So far it has been stressed that the diagnostic workup supplies the first basic clues as to what physical activities and environmental hazards the patient (*a*) should avoid completely, (*b*) could tolerate partially, and (*c*) could tolerate fully. In the process of attempting to define these three broad categories more specifically, the need has been emphasized to (1) work with a standardized list of activities and hazards in mind, (2) think and deal in terms of activity and stress ability instead of disability, (3) never sacrifice the all-importance of the individual for a group concept, (4) seek the balance of the fitness and unfitness to be found in each person, and (5) use specific rather than subjective terms in formulating recommendations.

The Constitutional Workup

Although the primary requirement for passing judgment on a person's physical qualifications is a full knowledge of the medical history and diagnostic data, it is doubtful that this basic information alone is sufficiently conclusive, especially if it is left divorced from an equally thorough knowledge of the constiutional makeup of the person. With regard to judging physical competence, the diagnostic results become meaningful only when they are related to the sex, age, height, weight, physique, temperament, and intelligence of the individual. To do this is neither time-consuming nor difficult, since the constitutional workup can readily become part of the physical examination.

Several physicians have reemphasized Hippocrates' notion about the significance of individual variations in human physique and temperament—notably, Kretschmer,[5] Draper,[6] Sheldon,[7] Parnell,[8] and Tanner.[9] With any of the terminologies used by these physicians, even a layman can estimate the endowments of a given physique in a matter of seconds. The current researches of Sills,[10] Jones[11] and Rien-

deau[12] suggest that the body components of rotundity, muscularity, and linearity may be significantly related to physical ability. The physician with a working knowledge of body typing and the ability to correlate the diagnostic and constitutional data may obtain additional clues to each patient's particular areas of strength and weakness.

The Workup of the Patient Himself

However conclusive the findings of the diagnostic and constitutional workups may appear, they are necessarily incomplete if during the process the patient himself has been allowed to disappear behind the results of an impressive battery of clinical tests. It is only by keeping in mind the totality of the patient as a person that his remaining abilities can be judged with success. Besides following clinical procedures, one must also look through the eyes of the patient at his experiences in the outside world to understand more fully the components of his ability to cope with activity.

Given the chance, almost every patient is eager to supply the inquirer with a wealth of clues to the degrees of strength, endurance, and physical skill in his makeup, merely through answering simple questions about his past activities and expectations for the future. Also, many times the patient's family and employer can supply further details. These particular clues are often of astonishing value and can radically alter one's clinical opinions up to this point either for or against the patient.

For example, a salesman and a stevedore with identical ages, diagnoses, and bodybuilds could easily have extreme variations in their remaining abilities as a result of the years of different physical conditioning they experienced in their divergent backgrounds. Moreover, however surprisingly, the differences between these two men could also easily be the exact opposite of what one might conclude from their occupational titles. Whereas the stevedore may have worked for years as a cargo checker and loafed on weekends, the salesman may have been required to lift and carry heavy machine parts during his daily sales demonstrations, besides performing the endless duties of operating a suburban farm after hours and on weekends.

Four extremely important points are involved here: (1) The occupational title without the specific requirements of the patient's particular job is potentially more of a hazard than a help. (2) Even a specific knowledge of the patient's job requirements is still hazardous without also knowing what he does off his job, especially on weekends. (3) A thorough knowledge of the patient's activities around the clock and around the seasons is needed to judge his physical potential properly. The salesman above, for example, because of his more strenuous and highly motivated behavior, would probably be judged far more physically competent than the stevedore. (4) A knowledge of the specific demands the patient is expected to meet is exceedingly important in deciding whether the patient is capable of continuing his activities or not. Again, however surprisingly, the physically inferior stevedore in the example could easily be fully capable of continuing his relatively simple work as a cargo checker, while the more able salesman could be advised to give up his demanding farming activities as well as to seek a less strenuous sales position.

In order to provide the physician with an array of objective clues to the patient's physical potential, the "Profile of Physical Demands" shown in Figure 2 has been developed. When questioning the patient, a physician may either fill out this form or merely use it as a guide to making mental notes. For best results, however, the form should be completed by a skilled job analyst, as detailed in a manual on this work.[3] The employers of some patients can supply the physician with this information upon request. It should be realized that a job analyst is usually in a better position than a physician to analyze the job through actual observation as well as to spend more time in questioning the patient about the activities off his job and thus complete a more accurate profile.

Concerning what happens off the job, it is wise to remember that the many titles for composite domestic and recreational activities like shopping, window washing, and boating require specific analysis in the same sense as occupational titles must be analyzed for specific content.

Window washing, for example, may also require lifting and carrying a heavy homemade two-story ladder plus considerable climbing. Each detail should be quantified and summarized, as in the illustrated profile. In addition, the effects of vacations and seasonal variations upon the patient's activities should be explored.

Firms using this method for employees whose capacity to work and lead a normal life has been disturbed, routinely provide the attending physician with a completed profile to assist him in judging the patient. The results shown in both Figures 1 and 2 are based on an actual case of a cardiac neurotic, and, as may be seen by comparing the two forms, it was determined in this case that the patient not only could meet the requirements of his work but also could increase his activities at home if he desired.

Profile of Physical Demands

Column (1) = Maximum Requirements On the Job. Column (2) = Maximum Activities Off the Job.

Written Numbers = Maximum Hours Performed — *Blank Squares = Not Required* — *+ = Required* — *E = Either Right or Left Permitted*

NAME Mr. John Doe POSITION Staff Assistant

LOCATION Claim Department - Home Office - B-2

(1)	(2)		PHYSICAL FACTORS:	
1/2	2	1	1 — 5 lbs.	Total Lifting Demands — Including Carrying and all Pushing and Pulling Effort
1/4	1	2	6 — 10 lbs.	
	1/4	3	11 — 25 lbs.	
	1/2	4	26 — 50 lbs.	
	1/30	5	51 — 75 lbs.	
		6	76 — 100 lbs.	
1/4	1	7	1 — 5 lbs.	Carrying Demands — *Carrying means that portion of Total Lifting which is required in Carrying and in Pushing and Pulling while Walking*
1/4	1/2	8	6 — 10 lbs.	
	1/2	9	11 — 25 lbs.	
		10	26 — 50 lbs.	
		11	51 — 75 lbs.	
		12	76 — 100 lbs.	
1/2E		13	Right	Fingering–Fine Dexterity
		14	Left	
45E	18E	15	Right	Handling–Including Coarse Fingering
1	1	16	Left	
1/4	1/4	17	Right	Reaching: Below Shoulders
1/4	1/4	18	Left	
1/2E	1/4	19	Right	Reaching: Above Shoulders
	1/4	20	Left	
	1/30	21	Right	Hammering or Throwing
		22	Left	
6	12	23	Sitting	
2	7	24	Total Time on Feet	
1 1/2	6	25	Standing	
1	2	26	Walking	
		27	Running	
		28	Jumping	
(a)	(b)	29	Stairs or Ramps	Climbing
	(c)	30	Ladders or Scaffolds	
	1/10	31	Right	Treading–Operating Foot Pedals: While Sitting
	1/10	32	Left	
		33	Right	Treading–Operating Foot Pedals: While Standing
		34	Left	
1/2	1/3	35	Stooping–Low-Back Bending	
1/2	1/3	36	Crouching–Knee Bending	
	1/2	37	Kneeling	
		38	Crawling	
		39	Reclining–Working Horizontally	
1/10	1/4	40	Twisting–Spine	
1/2		41	Waiting Time–Periods of Inactivity on Job	

(1)	(2)			
20/		70	42	Far–Snellen — Vision
20/	50	50	43	Near–Snellen — Vision
			44	Color — Vision
	+		45	Depth — Vision
+	+		46	Hearing
+	+		47	Speaking
			48	Other Physical Factors
			49	Other Physical Factors

ENVIRONMENTAL FACTORS:

8	24	50	Inside or Protected from Weather
1/4	8	51	Fair Weather — Outside Without Weather Protection
1/4	1/4	52	Wet Weather — Outside Without Weather Protection
		53	Hot °F_____ — Due to Conditions Other than Weather
		54	Cold °F_____ — Due to Conditions Other than Weather
		55	Sudden Temperature Changes — Due to Conditions Other than Weather
		56	Humid — Due to Conditions Other than Weather
		57	Dry — Due to Conditions Other than Weather
	1	58	Operating or Around Moving Vehicles or Objects
	1/4	59	Hazardous Machinery
	1/4	60	Sharp Tools or Materials
		61	Cluttered Floors
		62	Slippery Floors
	1/4	63	High Places
		64	Electrical Hazards
	1	65	Exposure to Burns
		66	Explosives
		67	Radiant Energy (Kind):_____
		68	Poor Lighting
		69	Poor Ventilation
		70	Toxic Conditions (Kind):_____
		71	Wet Working Quarters
		72	Close or Cramped Quarters
		73	Vibration
		74	Noise
3	3	75	Working With Others
7	3	76	Working Around Others
		77	Working Alone
Day		78	Shifts
		79	Other Environmental Factors
		80	Other Environmental Factors

REMARKS: (a) 4 flights of 5-12 steps.
(b) 10 flights of 2-6 steps.
(c) 8 trips up 10 rung ladder to set storm windows.

MP
ANALYST

John Doe
VERIFIED WITH

9-12-58
DATE

Fig. 2—Sample profile of physical demands.

The Rehabilitation Workup

Not every patient is so fortunate as the cardiac neurotic just above. Many cannot return to their previous positions, some not even to their homes. Yet, for many of these restoration through rehabilitation may open unexpected vistas of activity.

A rehabilitation center is perhaps the best environment in which to judge a given patient's performance tolerances, and, with a remarkable degree of objective accuracy. Each task the patient performs, whether washing his teeth, lifting weights, or operating a power tool, is in reality some kind of an objective test. Each test, moreover, is both physical and emotional in that it answers the questions of "*Can* the patient perform the task?" and "*Will* the patient perform the task?" And, most importantly, each task is a performance test that can be observed, measured, recorded, and communicated.

Additional accuracy in measuring physical and emotional ability is also possible in a rehabilitation center where the conditions are ideal for conducting many of the still more specific tests administered in clinical physiology for the purpose of calculating energy costs and the patient's degree of adaptation to his disability.[13-16] Also, psychological tests for occupational aptitude, as well as actual job proficiency trials, may supply still more conclusive clues to competence.

From the objective findings of the dozen or more professional members of a modern rehabilitation team, then, the physician can synthesize the results and construct a highly accurate "Profile of Physical Abilities," as is now possible in rehabilitation centers using the specific method for ability evaluation.* The reliability of this procedure should dispel the notion that lingers in some medical circles, namely, that physical ability cannot be judged scientifically and therefore amounts to nothing more than a guess.

Emphasis is needed here to stress a few extremely important points for the practicing physician. (1) He should not conclude ability evaluation is good only for severely disabled persons. (2) He should not lose heart for fear he cannot analyze ability with the accuracy of a rehabilitation team, since few patients need such an exhaustive analysis. (3) For the large majority of his patients, the physician can rely on the many clues to ability previously discussed. (4) In addition, he can test his patients on simple performance trials of his own choosing, such as stair climbing, distance walking and weight lifting. (5) If in doubt, he can refer his problem-patients to a rehabilitation center for a thorough workup.

Adaptation and Adjustment

As used here, adaptation has to do with the question of how well a patient is able to compensate for his disabilities within himself—that is, with the degree of *internal* strength, endurance, and physical skill he can develop in counterbalancing his organic defects. By contrast, adjustments involves the problem of how well he is able to use his physiological resources in meeting and adjusting to the *external* demands of society. Thus adaptation concerns the "inside," while adjustment concerns the "outside" of the individual.

It is in this light that a completed "Profile of Physical Abilities" represents an analysis not only of a person's inside adaptations but also of his competence to make outside adjustments. It is both diagnostic and prognostic. For an unemployed person, as perhaps a housewife, a profile becomes her prescription for safe and useful living to guide her throughout her daily activities. For an employed person, and especially for someone seeking employment, a profile first becomes a medical certificate of his abilities (not disabilities) to help him obtain employment, and then it becomes a work prescription to assist his employer in selecting a safe and productive position that will also allow the person to meet the requirements of activities off his job.

Besides these important uses, a profile in the hands of a physician becomes an exceptionally useful tool for counseling disturbed patients who possess physical abilities but suffer emotional blocks and are afraid to use them. Such might be the case of a patient who, after recovering from a spinal fusion, fears he can no longer lift and carry more than a pound or two. By completing a profile in his presence and discussing it with him—something he can see and understand—the physician may be able to give him enough insight to overcome his emotional blocks, especially if he is also assigned simple tasks like shopping and carrying the groceries to prove his abilities to himself. This approach has often succeeded where other procedures have failed, particularly authoritarian statements to the effect that the patient has no organic basis for his fear, that the trouble is all in his head and his fears are imaginary.

Finally, in connection with adaptation and adjustment, it should be remembered that within each person and within society there are always countless variable forces which keep

*Kessler Institute for Rehabiiltation, West Orange, N. J.; Bay State Medical Rehabilitation Clinic, Boston; and the Boston Dispensary Rehabilitation Institute, Boston.

both in a state of constant flux. Hence, the judgments one makes about ability are no more final than one's conclusions about disability are certain. In the same sense as a physician alters his opinions on the health of his patients from time to time, so should he reevaluate their abilities when changes for better or worse are observable. A followup evaluation is especially advisable after a recovered patient has had sufficient time to test his fitness in real life through some of his own approaches of trial and error within the limits prescribed by his physician.

Summary and Conclusions

There are at least as many clues to ability as there are signs and symptoms of disease and disability. One needs little more than an awareness to recognize these clues, hardly more than required to recognize the measles. In the place of guessing, it is possible to diagnose ability with the accuracy of diagnosing disability.

The primary requirements for evaluating the physical qualifications of a given person is a thorough knowledge of his medical history and clinical findings. The diagnostic workup supplies the first basic clues as to what physical activities and environmental hazards the person (*a*) should avoid completely, (*b*) could tolerate partially, and (*c*) could tolerate fully.

In taking the first tentative step to define these three broad categories more specifically, the need has been emphasized to (1) work with a standardized list of activities and hazards in mind, (2) think and deal in terms of activity and stress ability instead of disability, (3) never sacrifice the importance of the individual for a group concept, (4) seek the balance of fitness and unfitness to be found in each person, and (5) use specific rather than subjective terms in formulating recommendations.

With these beginnings, it was suggested that the next step should be to correlate the diagnostic data with the physique of the individual. A working knowledge of how to evaluate the constitutional endowments of his patients may provide the physician with additional clues to each person's particular areas of strength and weakness. On the other hand, results of both the diagnostic and constitutional workups can backfire if the patient as a person is forgotten. The patient himself can often radically change clinical opinions by supplying the inquirer with invaluable clues to his physical potential, merely through answering simple questions about his past activities and expectations for the future.

The accuracy with which physical, emotional, and occupational ability can be evaluated in a rehabilitation center has several implications for every physician. One should remember that each task a patient performs becomes an objective test of his physical and emotional tolerances that can be observed, measured, and communicated.

Throughout all of the above, the utility of a formalized technique has been illustrated in an effort to increase the possibilities of understanding the human components of ability to cope with activity in meeting the challenges of society.

Mr. Hanman's address is 12 Commonwealth Ave.

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The Development and Practice of Occupational Health in Chile

Hernan Oyanguren, M.D., Santiago, Chile

IN CHILE, services for the control of occupational health hazards and the provision of social security coverage are variably affected by certain economic, demographic, and epidemiological factors. Despite its natural wealth, economic development in Chile has been retarded. This is largely due to a lack of risk capital and equipment in an economy determined primarily by the mining industry. International price fluctuations are quickly reflected in the vigor of mining activities.

The average per capita income is estimated at $370 (U.S.) and many inequalities are readily noted. The management group, making up 5.4% of the employed population, receives 50.6% of the income. White-collar workers and laborers, who constitute 84.6% of the employed population, obtain 49.6% of the income. Cattle raising and agricultural activities do not produce enough food for the population.

The general population in Chile, according to the 1952 census, was nearly 6,000,000 persons. It is reasonably estimated that this is closer to 7,000,000 today. Of these, there is a gainfully employed group of 2,100,000 people, 17% of whom are employed in manufacturing industries, 5% in mining, and 31% in agriculture. These three groups alone account for 53% of the gainfully employed.

The population of Chile is young, with 37.2% under 15 years of age and 4% older than 65 years; this reflects high natality with a high infant mortality and an index of low economic development. While mortality and morbidity have decreased during the last few decades, life expectancy does not exceed 60 years. High infant mortality tends to keep this latter figure low. Cardiovascular and degenerative disease is in relative prominence as a cause of death in the older age brackets.

An analysis of the working conditions in Chilean industry was made in 1952 and yielded the following results for 665,830 workers.

From the Servício Nacional de Salud de Chile, Dirección General.

Dust exposure (organic and inorganic)	36.7%
Exposure to chemical products	32.5%
Physical risks	28.0%
Deficient safety	59.7%
Sanitary deficiencies	
Lack of potable water supply	6.2%
Lack of eating facilities	41.6%
Unsuitable toilet rooms	19.1%

One may roughly evaluate these exposures in three categories:

I. Occupational Accidents—For 1956, comparison is made with the United States:

	Chile	USA
Frequency rates per million man-hours	40.1	6.96
Severity rate per million man-hours	3,583	815

II. Occupational Disease and Injury—With metal mining the basic industry, silicosis is the major occupational disease of the country. According to various studies, it has been concluded that 10% of 60,000 workers have silicosis in varying stages of the disease. Lead intoxication is commonly considered prevalent in small factories. There are no accurate figures on its incidence. Occupational dermatoses do not constitute a well-defined problem.

Direct and indirect costs for compensable injuries totaled 1.5% of the national income in 1956. Adding the cost of absenteeism for nonoccupational injuries, costs equaled 3% of the national income.

III. Nonoccupational Disease—No accurate figures exist. It is estimated, however, that every worker loses 14 days a year due to a nonoccupational disease.

Social Security

Chile has a compulsory and highly developed system of social security for general diseases, disability and old age under government control. In the field of occupational diseases, however, the law is elective permitting private insurance companies and self-insurance. There are at present six private companies and one

State fund underwriting occupational disease risks. However, the government fund insures about 50% of the total insured workers. Workmen's compensation for occupational diseases is obsolete compared with the rest of the social security benefits in Chile.

Premium payments are established in relation to the expected risk. There is little incentive, however, for the employer to maintain a safe and healthful working environment inasmuch as there are no experience discounts for those employers who maintain good environmental conditions. The existence of "hazard pay laws" providing monetary bonuses to workers exposed in risky occupations frequently militates against the correction of such hazards. Larger companies, to some extent, resolve these difficulties through a self-insured program of medical care and hygiene for the community.

The Workmen's Compensation Act provides disability benefits and medical care for the worker during the course of injury. Temporary disability benefits amount to 75% of the daily salary. Permanent partial disability provides payment of a percentage of two years' salary, either in a lump sum or over a 12-month period. For example, a case of second degree silicosis with a 50% disability receives 50% of two years salary, or a year's salary, as a lump sum payment or in 12 monthly payments. Permanent total disability carries a life payment of 60% of the yearly salary exclusive of family allowances. In case of death, payment is made to the widow, and certain benefits are granted to the children. The widow receives 30% of the deceased's annual salary and each child 20% for a total of 40%. Thus, a mother and children can receive up to 70% only.

Medical care is provided free of charge by the medical department of the insurance companies or by a private physician appointed by the employer. The state insurance company maintains 11 hospitals throughout the country for the care of trauma. Modern rehabilitation is not practiced. These hospitals employ 30 physicians and have a capacity of 733 beds. They maintain ambulance services and outpatient clinics. The medical staff is considered good in traumatic surgery but weak in internal medicine. The large firms which carry their own insurance maintain excellent hospitals.

Claim procedures are generally simple, particularly in temporary disability. The first four days' disability is paid by the employer, with the remainder underwritten by the insurance companies. In the case of permanent disability, the employer notifies the local inspectorate of labor. The case is then adjudicated according to medical evaluation of disability made by physicians of the Public Health Service. A two-year contestable period following injury or illness preserves the worker's claim rights. In addition, following medical assessment, he may request a review any time within the next two years. Appeal rights exist in case of disagreement. Such appeals are heard in special labor courts, with the judge calling for a third impartial arbitrator. Unfortunately court action on such appeals may drag on for years.

National Health Service

The National Health Service, a part of the Ministry of Public Health and Social Security, provides preventive medical services for the entire population. Medical care is provided for workers and dependents and those who are not covered under social security legislation. The National Health Service was organized by a fusion of several former governmental activities, viz, the Bureau of Public Health, for the control of environmental hazards and promotion of health; the Welfare Bureau, operating outpatient services and hospital care; the Medical Services of the Workmen's Insurance Board for nonoccupational diseases, disability, and old age; and the Bureau of Child Protection, engaged in the promotion of children's health.

The Service is now currently divided into two units: (1) a central bureau, known as the Bureau of Standards, which develops standards and programs and advises the executive services, and (2) the executive services, established according to zones, which, in turn, are divided into health centers, which are the units of action. This bureau is known as the general bureau, and implements and carries out the policy of the first.

Occupational Health Services

Industrial hygiene in the public health program of Chile began in 1932, when a Division of Industrial Hygiene was organized in the Public Health Service. Being staffed with untrained personnel, the Division devoted most of its work to inspection of work places in Santiago, placing its main emphasis on sanitation. In 1944-45, a physician, an engineer, and a chemist were trained in the United States, but with the exception of the physician, who devoted part of his time to industrial hygiene, the other personnel never had an opportunity to engage in the field in which they were trained. With the aid of the Institute of Inter-American Affairs, (now International Cooperation Administration), the Division also acquired some laboratory and field equipment.

The Institute of Inter-American Affairs

continued its interest in the program by having a study made of the industrial hygiene problems of the country in 1947, and later, in April, 1951, assigned a consultant to the program, who remained with it until August, 1954. A Project Agreement between the Institute of Inter-American Affairs and the Public Health Service of Chile was negotiated in March, 1952, and is still in effect.

In 1953, legislation transferred responsibility for industrial safety and hygiene from the Department of Labor to the Occupational Health Service of the National Health Service. A team of physicians, engineers, and techincians was soon formed. Provided with the necessary laboratory equipment, field instruments, and transportation facilities, this team was enabled, for the first time, to approach the problems of occupational health in an organized manner.

A number of laws specify the authority for the control of industrial safety and hygiene in the industries and mines. Safety control in mines, however, is a function of the Department of Mines of the Ministry of Mines.

Industrial hygiene in Chile is organized along the same lines as the National Health Service, and is a subdepartment in the Department of Environmental Sanitation. It is officially called Sub-Department of Industrial Hygiene, Safety and Occupational Medicine. This subdepartment carries out its work through four sections: (1) laboratory (located in the School of Public Health), (2) industrial hygiene, (3) safety, and (4) occupational medicine. Each of these sections, with the exception of the chemical laboratory, contains one person who is the head of the Section; the chemical laboratory has two assistant chemists. Most of the personnel in industrial hygiene is located in the various zones. Some idea of the number of persons involved in this work at present may be obtained from the following staffing data. In addition to the chief of the subdepartment and the heads of the safety, medicine, industrial hygiene, and laboratory sections, there are six industrial hygiene engineers, eight safety technicians, one full-time physician, and five part-time physicians in Santiago province. There are two safety technicians and one industrial hygiene engineer in Antofagasta; one safety technician in Copiapó; one industrial hygiene engineer and two safety technicians in Valparaiso; one safety technician in La Serena; one safety technician in Talca; and one industrial hygiene engineer and two safety technicians in Concepción. Staff physicians are available only in Concepción (coal mines of the South) and Antofagasta (metal mines of the North). Here arrangements have been made with the Tuberculosis Services or the Board of Preventive Medicine to appoint a physician with experience in pulmonary diseases for the medicolegal assessment of disability from pneumoconioses.

This small group of professionals have received their training for the most part in occupational health in the United States, particularly in the Schools of Public Health of Harvard and Pittsburgh. Fellowships granted by the International Cooperation Administration have made possible this study abroad. The Chief of the medical branch of the Central Bureau had been granted a fellowship by the World Health Organization in order to study problems in his specialty in the United States and Europe for seven months. The present stature of occupational health in Chile has been made possible only through the help of the International Cooperation Administration, which provides instruments, educational opportunities, and facilities for transportation.

Operation of Occupational Health Services

Although the services are divided into two units, in general they tend to work together because of common problems. The Central Bureau, however, is not adequately staffed, particularly in medical personnel, for the achievement of its goals. This procedure works as well for other programs, such as maternal and child health and communicable diseases, where developed executive services exist which can be directed by the Central Bureau. A reasonable aim would seem to be to have an occupational health service in the capital at the national level, which could advise the zones and appoint the necessary professionals to the required positions.

Characteristically, occupational health activities are carried on by a team. Since January, 1955, physicians and engineers have been working together in mutual understanding of the environmental and clinical conditions. A number of studies have been made and presented before scientific associations during these last three years. Examples of this activity are represented by the following titles: Arsenic Poisoning in the Mining Industry; Manganese Poisoning in the Mining Industry; Tin Pneumoconiosis in Foundries; Asbestosis in the Manufacturing Industry; Mass Survey of Pneumoconiosis by 70 mm. Roentgenograms; Treatment of Silicotuberculosis; and Silicosis in the Manufacturing Industry.

The Central Bureau and Executive Services

THE CENTRAL BUREAU—The Central Bureau is charged with the following responsibilities:

1. Planning and programming of the activity of the subdepartment and the executive branches. Such programs may be cooperative efforts with other departments, e.g., the Sub-Department of Tuberculosis. 2. Advising the Occupational Executive Services, other departments of the National Health Service, and other institutions, such as employer's associations, unions, and governmental groups. 3. Promulgating rules and standards for routine field work and relationships with other services. 4. Promulgating laws and regulations. The specific legislation for safety and hygiene is prepared for the study of the legislative body. The reform of present Social Security provisions for occupational injuries has been studied, also. 5. Teaching. The personnel of the Central Bureau also teach at the Department of Occupational Health of the School of Public Health of the University of Chile. There are postgraduate courses in the main public health course in addition to courses for sanitary inspectors, and for technicians in safety and civil construction. Some teaching is also done at the School of Medicine.

THE EXECUTIVE SERVICES—When special medical problems arise in provinces, physicians from the Central Bureau and the Executive Service of Santiago travel to the site and appraise them, assisted by the engineers. In general, the personnel of the Executive Services perform the following tasks:

Physicians—I. Preplacement and periodic examinations of those workers exposed to specific occupational diseases, such as pneumoconiosis, lead intoxication, and the like. II. Mass x-ray survey studies in the pneumoconioses and coproporphyrin and lead assays for lead intoxication. Some of these studies are done for the purpose of research. III. Assessment of disability for medicolegal purposes. In pneumoconiosis, clinical, radiological and lung function tests are performed. Permanent disability due to accidents is assessed by an experienced traumatic surgeon.

Engineers—I. Control and study of hygiene conditions in working environments. II. Drawing-up and issuance of instructions for improving the status of the working environment.

Safety Technicians.—I. Surveying the general state of sanitary conditions and safety. In addition, the Executive Services may give practical advice on ventilation and safety measures to small industries unable to afford the services of specialists. Although it is not the responsibility of the National Health Service to control safety in mines, the Executive Services during their inspection for hygienic conditions make recommendations which may be voluntarily accepted by the industries. Responsibilities of the Executive Services may be supplemented by other services of the institution in the following manner: (1) Health Centers. The sanitary inspectors report to the Occupational Health Services the findings related to their field. The outpatient medical services make the preplacement periodic examination for the general health of the workers. (2) Psychotechnic Service. In the capital there is a specialized service which makes studies of aptitudes for work in selected professions at the request of employers.

Relations with International Organizations

In 1947, J. J. Bloomfield, of the International Cooperation Administration, set forth the general basic principles for the promotion of occupational health in Chile following his study of the problem at that time. Since that time he has been regional advisor. Equipment for the field and laboratory and transportation facilities are furnished by the International Cooperation Administration. The same administration provides fellowships for engineers and physicians. In the past year, x-ray equipment and a clinical laboratory have also been provided. Future plans call for the organization of an Institute of Occupational Health with the cooperation of the National Health Service and the School of Public Health. It is expected that North American experts in occupational health will advise on the organization of the courses. Conversations have also been carried out with members of the World Health Organization for the express purpose of helping to develop an Institute of Occupational Health.

Future of Occupational Health

Considering the complexity of our problems, it would appear that further advances will be dependent upon the following factors:

1. Adequate reform of the social security law to stimulate interest of employers in preventive measures and the provision of better protection for the workers.

2. Implementation of personnel and equipment in the Occupational Health Service.

3. An aggressive program of health education, promoting the interest of employers and workers in safety and hygiene.

4. Education at all professional levels for the purpose of fostering increased interest in occupational health problems.

5. Development of comprehensive programs of health in industry broader than the concept of emergency treatment of occupational injury.

Dr. Oyanguren's address is Servício Nacional de Salud, Direccion General, E. Mac-Iver, 541, Box 3979, Santiago, Chile.

Toxicology of Some Aliphatic Ketones

Edward V. Henson, M.D., South Charleston, West Virginia

THE KETONES are the first of the homologous series to be considered in these reviews that belong to the great group of chemicals known as *industrial solvents*. Although some of the hydrocarbons, such as heptane and hexane, and hydrocarbon mixtures, such as gasoline and kerosene, have useful solvent properties, their primary applications depend upon properties other than their solvent actions. Isolated members of the aliphatic acids and aldehydes, which have been discussed previously, may also have special solvent uses, but they, too, are generally not regarded as solvents. Doolittle[1] stated that prior to the development of the vinyl resins acetone and methyl ethyl ketone were the only ketones manufactured in any quantity in the United States. Solvents for resins created a demand for ketones and brought additional members of the series into prominence. Once available in quantity by the newer catalytic production methods, many commercial applications were found for them. The American production of acetone in the early 1950's approximated 550,000,000 pounds. This volume was exceeded only by that of ethylene glycol and the lower members of the alcohol series. Although the bulk of the ketones is used in industry as chemical intermediates and process solvents, large quantities are found in such household items as varnishes, lacquers, and paint removers and thinners. The publication of only a few reports of intoxications is evidence that ketones as a group have a relatively low order of toxicity. The cases which have been recorded in the literature resulted from exposures to high concentrations of vapors or from large skin surface areas contacting acetone solutions. Since the fire hazard from the more volatile members with low flash points is great, the necessity to prevent fire helps at the same time to assure a satisfactory working environment. Although the higher homologs are more toxic to animals than are the short-chained members, their lower volatility usually prevents accumulation of hazardous concentrations.

In the following sections remarks will be made about the general actions and chemistry of the ketones, and representative members of the aliphatic ketones will be considered in some detail.

Dr. Henson is Plant Medical Director, Union Carbide Chemicals Company.

Summary of Action

The members of the ketone family of chemicals are irritating to the mucous membranes of the eyes and nasal passages and have measurable toxicities and narcotic effects. They have a defatting action on the skin which may increase the skin's susceptibility to infections and the detrimental action of other agents. Schwartz, Tulipan, and Peck[2] stated that dermatitis had not been reported from the ketone solvents, although they, themselves, saw cases that might have been caused by methyl ethyl ketone.

Specht, Miller, Valaer, and Sayers[3] studied a group of methyl ketones, namely: dimethyl ketone (acetone), methyl ethyl-, methyl propyl-, methyl *n*-butyl-, methyl *n*-amyl-, and methyl *n*-hexyl ketones. They also compared several ketones which contain six carbons: methyl *n*-butyl ketone, methyl isobutyl ketone, mesityl oxide, acetonylacetone and cyclohexanone. The effects on guinea pigs were recorded as irritation of the cornea and conjunctiva; irritation of the buccal, nasal, and pharyngeal passages; and depression of the central nervous system. These three effects were determined by observing squinting, lacrimation, rubbing of eyes, sneezing, coughing, salivation, rubbing of nose and mouth, postural instability, and loss of auditory and corneal reflexes and measuring the respiratory and pulse rates and rectal temperatures. The data in these experiments showed that with equivalent concentrations of the straight-chain methyl ketones the tendency to produce mucous membrane irritation in-

creased with an increase in the number of carbons and that the *relative narcotic effectiveness* of the ketones increased in the same way. When acetone was given a value of 1, the narcotic ratings were derived by determining the concentration of vapor necessary to produce coma in a standard time. The findings are listed in Table I.

Among the 6-carbon ketones the order of increasing narcotic effectiveness was found to be acetonylacetone, cyclohexanone, methyl isobutyl ketone, methyl isobutenyl ketone (mesityl oxide), and methyl *n*-butyl ketone. It was also noted that of the isomers, methyl butyl ketone and methyl isobutyl ketone, the branched or iso- compound had the lesser narcotic effect. The unsaturated, branched methyl butyl compound, mesityl oxide, was significantly more narcotic than the saturated branched ketone. Observations upon other homologous series have established that a measured physiological effect is usually decreased as the carbon chain is branched and increased as it is unsaturated.

Haggard, Greenberg, and Turner[4] studied the physiological principles governing the action of acetone. They observed that although the rate of metabolism was greater with high blood concentrations, at high levels elimination by respiration and urinary excretion was more important than loss by metabolism. At low levels the reverse was true. The metabolic loss-rate was less, but loss by metabolism was proportionately more important. They stated that it was a good approximation that the concentration in the blood varied directly with the concentration inhaled, and absorption continued at a progressively diminishing rate until equilibrium was approached. With continuous 24-hour exposures, it took three to four days for a stationary concentration in the blood to be reached, and the time did not vary with the concentration respired.

Studies on the human sensory response to certain industrial solvents including several ketones have been made.[5, 6] Comparisons of the irritant effects on the eyes, nose, and throat are difficult because of the difference of exposure times. However, in all instances, an estimation was made of the highest concentration which the majority of subjects considered satisfactory for an eight-hour period. The estimated satisfactory concentrations for eight hours and the recommended threshold limit values[7] in parts per million for the ketones thus studied are listed in Table II. It can be observed that there is a striking degree of correlation between the values, which may result from the practice of basing threshold values on employee comfort when no important physiological consideration exists. In those instances where an interpretation of guinea pig comfort can be made, the order of the listing in Table II seems to be correct.

Table I—Relation of Number of Carbons to Narcotic Effectiveness

Number of Carbons	Alkyls in Ketones	Narcotic Effectiveness
3	Dimethyl (acetone)	1
4	Methyl ethyl	3.9
5	Methyl propyl	4.2
6	Methyl butyl	9.8
7	Methyl amyl	11.8
8	Methyl hexyl	19.5

Table II—Relation of Estimated Satisfactory Concentrations and Threshold Limit Values in ppm

	Satisfactory Concentration	Threshold Limit
Acetone	200	1,000
Butanone	200	250
Methyl isobutyl ketone	100	100
Diacetone alcohol	50	50
Cyclohexanone	25	100
Diisobutyl ketone	25	50
Mesityl oxide	25	25
Isophorone	10	25

Larson, Finnegan and Haag,[8] using their method of quantitatively evaluating the edema-producing potencies (EPP) of chemicals in water solution on mucous membranes, determined that methyl ethyl ketone (butanone) was more irritating than acetone. Other ketones were too insoluble in water to be studied. Their limited data confirm the observation that irritation increases with increased molecular weight. The data also show that ketones are much less irritating than aliphatic acids or aldehydes with equivalent carbon atom content.

The single oral LD_{50} for rats in grams per kilogram can be used as a measure of the toxicity of chemicals. Smyth and his coworkers[9-13] reported LD_{50}'s for many chemicals including ketones. If the ketones are listed in the order of increasing carbon content, the open-chain, saturated ketones tend to increase in toxicity with increasing molecular size, as reflected by the decreasing dose required to kill 50% of the test animals. However, this is not an undeviating trend, since 9-carbon diisobutyl ketone is much less toxic than would be predicted solely on the basis of its carbon content. Table III shows the relation of carbon number to LD_{50}.

In a discussion of metabolism of ketones, Williams[14] stated that it appears probable that

Table III—Relation of Carbon Number to LD_{50}

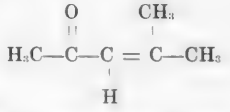
Carbon Number	Name	LD_{50}
3	Dimethyl ketone (acetone)	9.75
4	Methyl ethyl ketone	3.98
5	Methyl propyl ketone	3.73
5	Diethyl ketone	2.14
5	Acetonyl acetone	2.74
6	Cyclohexanone	3.46
6	Methyl *n*-butyl ketone	2.59
6	Methyl isobutyl ketone	2.08
6	Mesityl oxide	1.42
7	Methyl *n*-amyl ketone	1.67
7	Ethyl butyl ketone	2.76
9	Diisobutyl ketone	5.75

many ketones are reduced to secondary alcohols and then excreted in conjugation with glucuronic acid. He reported that with the exception of acetone, the ketones increased the urinary excretion of glucuronides in rabbits. Acetone is oxidized with difficulty, and, along with other lower ketones, a significant percentage is excreted unchanged. Dogs given oral doses of acetone, methyl ethyl ketone, methyl propyl ketone, and diethyl ketone excreted these substances in percentages of 50-60, 30-33, 21-27, and 0-9, respectively.

The Chemistry of the Ketones

The ketones and the aldehydes have the general formula $C_nH_{2n}O$ and are characterized by the presence of a carbonyl group, =C=O. Both series of compounds can be represented by the formula, $RC(=O)R'$. With aldehydes, R′ is a hydrogen and R is an alkyl group; while with ketones, both R and R′ are alkyl groups. Since in aldehydes R′ is a hydrogen, the functional unit, $-C(=O)H$, —CHO, is at the end of the chain. On the other hand, both R and R′ of ketones are radicals containing at least one carbon. As a result of this, the functional unit of a ketone is located internally in the chain. The symmetry of the ketone molecule is dependent upon the similarity of dissimilarity of the alkyl groups.

Ketones are identified by three systems of nomenclature of which only two have importance. In contrast to some other homologous series, most ketones were identified as individuals relatively late historically, after the development of technical systems of nomenclature; so, except in a few instances, the first method, that of trivial names, does not apply. The second method, which is the most commonly used, identifies the radicals or chains attached to the carbonyl or ketone carbon. By this system the first of the ketone series is dimethyl ketone or acetone, CH_3COCH_3. This method can name compounds of great length and structural complexity, but it usually is applied when short radicals such as methyl, ethyl, propyl, and butyl are present. Because the word ketone carries with it the presence of the carbonyl carbon, the total number of carbons in a ketone, when named by this system, is one more than the sum total of carbons in the identified radicals. The third method of nomenclature is the Geneva system, which identifies a ketone by adding the suffix *-one* to the parent hydrocarbon. The suffix *-one* may have been derived from the last three letters of aceto*ne* or keto*ne*. Since the carbonyl group is positioned internally in the chain and may be in one of several locations, and since clarification of the location may be necessary to prevent ambiguity, its position can be designated numerically. This uncertainty of position can be present in compounds with five or more carbons, as in $CH_3COCH_2CH_2CH_3$ (2-pentanone) and $CH_3CH_2COCH_2CH_3$ (3-pentanone). Although some references place the "location" number at the end of the name, as pentanone-2 and pentanone-3, the preferable location, in American literature, is preceding the name, as in the first illustration. Compounds containing side chains, functional groups, and unsaturation can be identified precisely by the official system, although at first glance the names may appear bizarre. For example, the name for mesityl oxide is 4-methyl-3-pente*n*-2-one



which locates a methyl side-chain on carbon 4 of a 5-carbon chain, ethylenic unsaturation starting at carbon 3, and a ketone unit at carbon 2. If one prefers counting the carbons from the reverse end of the chain, the order becomes 2-methyl-2-pente*n*-4-one. Both names are applicable to mesityl oxide, and the same structural formula is derived from both names. The relative importance of the functional units in a compound determines how the compound is numbered. More than one carbonyl can be present in the same compound, thus forming diones or triones. Whole series of polyfunctional ketones are known. The basic rules of nomenclature can be found in standard refer-

The chemical information used throughout this review was obtained from Richter,[15] Whitmore,[16] and Fieser and Fieser.[17]

Table IV—Relation of Carbon Number and Nomenclature

Number of Carbons	Common Name	Official Name
3	Dimethyl ketone	Propanone
4	Methyl ethyl ketone	Butanone
5	Diethyl ketone	3-Pentanone
5	Methyl *n*-propyl ketone	2-Pentanone
5	Methyl isopropyl ketone	3-Methyl-2-butanone
6	Methyl *n*-butyl ketone	2-Hexanone
6	Methyl isobutyl ketone	4-Methyl-2-pentanone
6	Ethyl *n*-propyl ketone	3-Hexanone
6	Ethyl isopropyl ketone	4-Methyl-3-pentanone
6	Mesityl oxide	4-Methyl-3-penten-2-one
7	Di-*n*-propyl ketone	4-Heptanone
7	Methyl-*n*-amyl ketone	2-Heptanone
7	Ethyl *n*-butyl ketone	3-Heptanone

ences, such as the "Handbook of Chemistry and Physics."[18] The relation of the number of carbons and nomenclature is illustrated in Table IV.

The boiling points of the ketones increase with the length of the chain. For straight-chain compounds the increment is about 25°C for each additional carbon, but this is not an absolute figure. The compounds with side chains boil at a lower point than straight-chain compounds with an equal number of carbons, as is usually the case with boiling points of members of other homologous series.

The chemical reactivity of ketones is similar to that of aldehydes, but, lacking a carbonyl hydrogen, most reactions are slower and less certain of completion. The ease of reactivity is determined by the length of the attached alkyl groups, the shorter compounds being the most active. Ketones are derived from secondary alcohols by oxidation and are more volatile than their parent alcohols. While aldehydes are easily oxidized to the corresponding acids, further oxidation of ketones is difficult; and when it is accomplished, the chain is broken with the formation of two shorter-chained acids. Aldehydes tend to polymerize, but ketones do not. Both undergo condensation reactions. For example, acetaldehyde condenses to acetaldol, which can be dehydrated to the unsaturated aldehyde, crotonaldehyde. Acetone can condense to diacetone alcohol (4-methyl-4-hydroxy-2-pentanone), which upon dehydration forms the unsaturated ketone, mesityl oxide. The ketone condensation and dehydration reactions take place with comparative difficulty.

The ketones vary in physical form from liquids at the lower molecular weights to solids at about C_{12}. Water solubility decreases rapidly with increasing chain length, but all are soluble in ether and alcohol. The ketones are often described as having a sweet or fruity odor, which characteristic makes some of them valuable in the manufacture of perfumes.

Acetone

Acetone, dimethyl ketone, propanone, CH_3COCH_3, is the first member of the ketone series. It has a molecular weight of 58.08, is a colorless flammable liquid boiling at 56.1°C, has a pleasant aromatic odor, and is miscible in all proportions with water, alcohol, and ether. The threshold limit value is 1,000 ppm, and the single oral LD_{50} for rats is reported at 9.75 gm per kilogram. Being an excellent solvent, it has extensive industrial use in the manufacture of rubber, synthetic fibers, plastics, varnishes, lacquers, cements, smokeless powders, photographic films, and paint removers. It is frequently used in degreasing and cleaning procedures. Its capacity to absorb large quantities of acetylene permits safe and economical handling of acetylene in cylinders. Acetone-dry ice slurries are used in laboratories to produce low temperatures.

Acetone and acetone-acids are normal metabolic products formed by the beta-oxidation of fatty acids. In abnormal metabolic states, such as uncontrolled diabetes mellitus, these acetone bodies can accumulate in significant, detrimental quantities. The metabolism of acetone-2-C^{14} has been studied in rats, and the substance has been found to be catabolized to acetate, formate, and a 3-carbon unit. The acetate route seemed to predominate.[19]

Acetone vapors can cause irritation of the mucous membranes of the eyes and respiratory tract, and continued exposure to high concentrations may cause bronchitis.[20] The open cup flash point of acetone is –9°C, and it forms explosive mixtures with air in concentrations of 2%-13% by volume.[21] The fire hazard thus associated with the use of acetone makes it necessary to prevent accumulation of acetone vapors to the concentration necessary to cause these effects. Its solvent, defatting action on the skin encourages the development of eczematous changes and secondary infections.

Central nervous system depression progressing to narcosis can occur. One reference[20] quoting Kagan's work with cats reported that 32 mg per liter for 180 minutes and 125 mg per liter for 70 minutes produced deep narcosis. These concentrations are approximately 13,500 and 52,700 ppm, respectively. The U.S. Public Health Bulletin[3] about ketones summarized previous vapor exposure studies of guinea pigs to acetone. One, two and five per cent concentrations in air all caused a decrease in rectal temperature, respiratory rate, and heart rate,

the temperature decrease being more uniform than the other two. With 2% acetone vapor slight lacrimation was evident in 25 minutes and in 4 hours the animals were not very steady on their feet. With all concentrations of vapors the acetone content of the blood increased continuously and there was no evidence that an equilibrium with the external vapor was reached. This finding is consistent with the experimental results of Haggard et al.,[4] and the failure to reach an equilibrium would be understandable and expected for these exposure times.

Human intoxications from acetone are not common but can occur from unusual sources. The literature contains reports [22-26] of several cases of acute acetone poisoning following the application of casts made from synthetic resinous material treated with a setting fluid of which acetone was the main ingredient. The advantages of casting material of this type over conventional plaster are its light weight, washability, and radiotransparency. In all cases large surface areas of the body were covered. The odor of acetone was prominent, and, although the illnesses were thought to be caused by the inhalation of acetone, skin absorption could not be excluded except in one instance where the cast was applied as a protective layer over a plaster-of-paris cast. After a latent period of 8 to 12 hours, nausea followed by vomiting of blood-tinged, brown-stained, or coffee-ground material occurred. Lethargy, unconsciousness, and deepening coma appeared. With increased room ventilation or removal of the casts progressive clinical improvement followed, with recovery being complete in 24 to 48 hours. Acetone and sugar were found in the urine in several cases. In one case the CO_2-combining power was determined and was normal, indicating that ketosis was present without acidosis.

Methyl Ethyl Ketone

Methyl ethyl ketone, butanone, $CH_3CH_2COCH_3$, has a molecular weight of 72.11 and is a colorless, flammable liquid boiling at 79.5°C. It is soluble in water up to 26%, soluble in alcohol and ether, and has an odor resembling acetone. Methyl ethyl ketone is a good solvent for cellulose acetate and certain resins and is used in making artificial leather. It also is used in making varnishes, lacquers, and paint removers, and finds use as an extractant of oils and pharmaceutical products. The lower flammable vapor concentration is about 2%, at which concentration there is distinct warning by its odor and irritating properties.

The threshold limit value is 250 ppm, and the single oral LD_{50} for rats is listed as 3.98. Patty, Schrenk, and Yant[27] studied the acute response of guinea pigs to vapors of butanone and recorded the time-dose for the appearance of nasal irritation, eye irritation, lacrimation, narcosis, and death from concentrations varying from 0.33% by volume to 10% by volume. The 0.33% concentration (3,300 ppm) produced no ill effects during the observation period of 810 minutes (13.5 hours). Nose and eye irritation (manifested by rubbing the nose with the paws and squinting) appeared immediately with 10% vapors, within one minute with the 3.3% concentration, and in two to four minutes with the 1% concentration. Narcosis evidenced by unconsciousness appeared in 10-11, 48-90, and 249-280 minutes for the 10%, 3.3%, and 1% concentrations. Death did not occur with the 1% vapor but did occur in 45-55 minutes and 200-260 minutes with 10% and 3.3% vapors.

Exposure of animals to the 10% vapor for 30 minutes or more caused the cornea to become opaque. This opaqueness gradually disappeared, and the eyes returned to normal in eight days. Lower concentrations did not produce corneal opacities. In those animals which received maximum but not fatal exposures, pulmonary congestion and emphysema and congestion of the brain, liver, and kidneys were found at autopsy. When death occurred during exposure, it was not clear whether it was due to irritation of the lungs or to the narcosis.

In men, 10% and 3.3% vapor concentrations produced immediately intolerable irritation of the eyes and nasal passages, 1% had a strong odor and was almost intolerable after several inhalations, and 0.33% vapor was moderately irritating. The authors observed that concentrations which gave distinct warning to men were harmless to guinea pigs after several hours' exposure, and those which were practically intolerable to men produced no serious effects in animals in one hour. It is apparent that the odor and irritation of this ketone gives sufficient warning to prevent harmful exposures.

Specht et al.[3] also observed the effects of methyl ethyl ketone on guinea pigs. With 1%, 2.5% and 5% concentrations there was a progressive depression of rectal temperature, respiratory rate, and heart rate. The more concentrated vapors caused an earlier and greater depression of these functions, and with these functions as criteria butanone is a more effective narcotic agent than acetone.

Methyl Propyl Ketone

Methyl propyl ketone, 2-pentanone, CH_3-

$COCH_2CH_2CH_3$, has a molecular weight of 86.14 and is a colorless flammable liquid boiling at 102°C. It is slightly soluble in water, is soluble in alcohol and ether, and has an odor resembling the other ketones. It dissolves resins, waxes, and oils and has many applications as a solvent. Having a higher boiling point and lower vapor pressure than the shorter members of the series, the fire hazard is considerably less. The threshold limit value is 200 ppm, and the single oral LD_{50} for rats is reported as 3.73 gm per kilogram. Concentrations of 3% to 5% by volume in air were dangerous to guinea pigs in 30-60 minutes, 0.5% was the maximum concentration which was tolerated for one hour without serious effects, and 0.15% was apparently safe for several hours of exposure.[20] Short exposures of man to 0.2% to 0.4% vapors were very irritating, and 0.15% had a strong odor and caused irritation of the eyes and nose. Concentrations which were without effect on guinea pigs after several hours had warning properties of odor and irritation. Pentanone is more irritating than butanone, and its narcotic effectiveness is about twice that of butanone.[3] Animals that died during exposure had pulmonary emphysema, edema, and congestion.

Methyl Butyl Ketone

Methyl butyl ketone, or 2-hexanone, is a colorless liquid boiling at 127.2°C and has a pungent acetone-like odor. It can be used as a solvent of resins and in the making of lacquers and varnish and lacquer removers. The threshold limit value is 100 ppm, and the single oral LD_{50} for rats is given as 2.59 gm per kilogram. The approximate flammable limits are 1.2% to 8% by volume in air, in which concentrations the substance is disagreeable to human subjects. With guinea pigs, 1% to 2% was dangerous to life in 30-60 minutes; 0.4% to 0.6% was dangerous to life after several hours; and 0.1% was tolerated for several hours with slight or no symptoms.[28] The 0.1% concentration was found by human beings to have a strong odor and caused moderate eye and nasal irritation. The deaths that occurred were during exposure and no animals died after exposure. The authors thought that the fatalities were due to a state of narcosis rather than to pulmonary irritation. The acute toxicity of hexanone was given as approximately twice that of pentanone and five times that of butanone. As measured by rectal temperature, respiratory rate, and heart rate, the depressant action of methyl butyl ketone is greater than the previously mentioned ketones.[3]

Summary and Comment

The most important physiological response to the inhalation of any of the ketones is narcosis. In the industrial application of these materials, this anesthetic effect is usually not observed; for, with concentrations at which this could occur, the ketones give adequate warning by odor and irritation of the conjunctiva and mucous membranes of the upper respiratory tract. There is sufficient evidence to show that the narcotic and irritating effects and toxicities of the ketones increase with an increase of molecular weight. Their solvent action on the skin is not of primary importance but may be conducive to secondary changes by sensitizing agents and infections.

The absence of reports of intoxications by ketones despite the enormous volumes used industrially indicate that the low order of toxicity of these substances for experimental animals holds as well for man.

Dr. Henson's address is Union Carbide Chemicals Company, South Charleston 3, W. Va.

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Industrial Medical Association

THE PRESIDENT'S MESSAGE

D. JOHN LAUER, M.D.

"STICKS and stones may break my bones, but words will never hurt me!" How often have you heard children chanting these lines in defense against a tormentor? The very denial eloquently bespeaks the hurt. Many of us summon a comparable defense against a request to express ideas publicly in speech or writing: we chant that public expression is a matter of no importance in any case.

We hope that the members of IMA will look upon our journal as an instrument for personal advancement in the area of authorship. We are determined that it be more than just another piece of reading material for members—a vehicle for standard research reports and a repository of committee minutes. Rather, it is a medium in which each of us has a fair opportunity to express himself in print, a forum in which to report ideas and accomplishments.

Now, authorship is a difficult task for most of us. In general, we seem to be able to express our thoughts and ideas quite well to one another in relaxed conversation. Yet, when we try to put ideas on paper for publication the thought stream all too often goes into a solid freeze. The IMA Board of Directors established our journal with a determination to have a professional publication of high standards, worthy of our young and vigorously growing specialty. An early step toward this end was the selection of an able editor. To balance his responsibility for building a first-class publication, we gave him and his editorial board freedom to determine the new journal's contents. We got what we expected—good articles that are pertinent to some segment of our membership, whose reported observations and conclusions are buttressed by supporting facts and reliable references, all presented in good language.

The accomplishment to date has undoubtedly been a Herculean task. Choosing the best of the materials presented to satisfy the diversified needs of our membership is in itself a bit of work. When to this we add the requirement of keeping friends and influencing people—the public relations of the editorial function—the job must be really tough. Each of us who reduces pet ideas to writing is often very touchy about adverse criticism. It is much like a mother's reaction to any criticism of her child. To her, the little darling is the best, the most talented, and the most beautiful! Were the "children" which most of us produce published as submitted, our journal—or for that matter any good periodical—would quickly deteriorate into a testimonial rag.

An editor's life is not a happy one! But in order to get out a good product our editor and his associates are prepared to work with you and me—suggesting revisions, clarifications, syntax changes, and improved rhetoric. All of this is done to capitalize on this useful tool of education—the JOURNAL OF OCCUPATIONAL MEDICINE—to bring out hidden talent, new ideas, and fresh expressions of thought. Every one of us is prouder of a substantial piece of work that has about it the look and feel of skill than is the case when substance stands alone.

Heaven forbid that there should now be a rush for the ink pots to dash off profound articles that have been resting in latency! Rather, let the beginner crawl before he runs. Starting with the January issue, our journal will devote some space to case reports. This is the way to start. The occupational cases that have taught you something probably have equal teaching value for the rest of us. The guidelines to be used in the preparation of case reports are available for the asking, either at our headquarters office in Chicago or the editorial office in Pittsburgh.

Book Reviews

INTERNATIONAL STANDARD CLASSIFICATION OF OCCUPATIONS. Published by the International Labour Office, Geneva, 1958. Price, $3.50. International Labor Office, Washington Branch, 917 15th St., N.W., Washington 5, D.C.

Although few industrial physicians have felt the need for an international standard classification of occupations, the field of occupational medicine is expanding so rapidly and in so many different directions that a classification of this sort may soon be needed, if in fact it does not already exist. As pointed out in the preface and introduction. "The classification has been designed as a comprehensive, multi-purpose instrument for use in the organization of occupational information. . . . Its general groupings are intended to facilitate the classification of statistics derived from labour force inquiries, particularly population censuses, while the final subdivisions are calculated to meet the requirements of employment placement for a more detailed classification."

For the benefit of governments which have framed their national occupational classification systems on the lines followed by the International Classification of Occupations for Migration and Employment Placement, the I.L.O. has prepared a conversion table (available on request) which shows the relationship between the two systems. The fact that not only is this a very carefully thought-out document with broad coverage and at the same time rather detailed description of classified jobs, but also is tied into census data from many countries makes this a particularly useful classification for anyone interested in comparing his own group with other groups and other areas or even other countries. As pointed out in the Preface, the publication of the international standard classification of occupations not only marks the accomplishment of a difficult task but also represents the beginning of a new phase, in which emphasis will be placed upon refinement and improvement.

If this classification is used as a framework into which almost any type of employment can fit, there should be no feeling that in classifying or codifying occupations flexibility is lost. As I review the basic approach to this classification, the definitions are in terms of work customarily performed and where there is a conflict of administration and work actually performed the latter takes precedence. This should be a useful grouping when studying occupational diseases.

"In general, the groups are broad enough so that it should not be too difficult to find individual groups or combinations of similar occupations in a given area which would be meaningful. . . . The descriptions like the classifications have been kept as general as possible, however, the definitions have been very clearly thought out so that there is little likelihood of miscoding an operation or job if the person coding is familiar with the actual nature of the work. The classification represents the work of an informed and dedicated committee." Not only is the classification well thought out but the same high quality of job descriptions has been maintained for all trades and industries. This classification or later expansions should find increasing application in industrial medicine as more of the statistical work is carried out by machine and it is possible to compare the experience of other groups.

—EDWARD C. RILEY, M.D.

REHABILITATION OF THE CARDIOVASCULAR PATIENT. By Paul Dudley White, Howard A. Rusk, Philip R. Lee, and Bryan Williams. Price, $7.00. Pp. 176. McGraw-Hill Book Company, Inc. The Blakiston Division, 330 W. 42nd St., New York 36, 1958.

The progressive advances in recent years in the field of cardiovascular rehabilitation are of definite interest, not only to industrial physicians, but also to *all* individuals who bear the responsibility for treating or counselling patients with cardiac or cerebrovascular disease. This short book by distinguished workers in this field is an excellent, basic reference, which provides a comprehensive coverage of this facet of rehabilitation.

The fact that cardiovascular disease is now America's outstanding medical problem, and the tremendous, adverse effect of disability from this type of disease upon industry, are described. It must be appreciated that a majority of the patients with known cardiovascular disease can return to employment, and that a sizable number of this group, as a result of extensive training and experience on the job, are valuable assets to their employers. Specific guidelines for rehabilitating this partially disabled group with cerebrovascular disease, rheumatic heart disease, arteriosclerotic heart disease, hypertensive heart disease, and congenital heart disease have been delineated and are presented in a brief, easy to read, manner.

After two short introductory chapters, the authors discuss in Chapter 3 how the physician, or preferably the rehabilitation team, can assess the rehabilitation potential of the individual with cerebral vascular disease. Through a careful analysis of the patient's ability to communicate with others, of his over-all emotional state, of his prior social and vocational status, and of his capability to perform motions essential primarily for daily living and then later for return to employment, and by evaluating these findings in the light of accumulated knowledge concerning which factors are known to be either favorable or unfavorable toward successful rehabilitation, one may establish practical rehabilitation goals. The sequential steps for returning the individual to home adequacy (independent self-care), or to vocational adequacy later, include prevention of deformities, selective muscle reeducation, exercises for balance, speech therapy, ambulatory training, and education in appropriate

self-care activities. This program is supplemented by psychiatric, social, and vocational assistance, as indicated. Charts useful for objective measurement of the gradual improvement in the patient are presented, and several self-help devices are described.

The last five chapters of the book contain the principles of cardiac rehabilitation: (1) evaluation of the patient's physical, social, mental, and vocational status; (2) optimal therapy on an individualized basis for the specific type of heart disease; (3) relief of the patient's fear of his illness by appropriate educational efforts, and (4) job placement so that the patient's capabilities are matched to the energy output required for the job. Positive motivation on the part of the patient is of major importance, and a close doctor-patient relationship provides the individual with necessary support and confidence to return to an active life.

Many of us who graduated from medical school one or more decades ago, and some of our more recent contemporaries, have not received during their medical school years formal training in this field of rehabilitation, which is becoming progressively more important as the prevalence of heart disease increases among our gradually expanding geriatric population. The proper return and selective placement of these individuals in industry round out and complete a "good course" of medical therapy, and provide the community with another individual who continues to be economically independent and socially and emotionally adjusted, instead of an additional welfare charge.

—LIEUT. COL. R. G. DANIELS, U.S. Army

THE CHEMISTRY OF INDUSTRIAL TOXICOLOGY. By Hervey B. Elkins, Ph. D. Ed. 2. Price, $11.50. Pp. 452, John Wiley & Sons, Inc., 440-4th Ave., New York 16, 1959.

The second edition of this well-known and very practical book maintains the style of the earlier edition, but with extensive revisions of some of the chapters. Chapters 1 and 2 are unchanged. Chapters 3 to 10 deal with the toxicities of the elements and inorganic and organic compounds, and include the more important new developments in industrial toxicology. A separate chapter on radioactive isotopes has been added. This is followed by a general discussion of preventive measures, a very good chapter on industrial operations and processes, and discussions on maximum allowable concentrations, and air-sampling devices. The last section consists of 127 pages of analytical methods and procedures for the analysis of air and biological material for the toxic substances likely to be encountered more frequently in industrial establishments. The bibliographic section lists 555 separate references.

This reviewer knows of no other book that contains more information dealing with the general principles of the toxicity, the control, and the evaluation of the chemical factors potentially hazardous to health. The book, therefore, must be considered a reference work which should be on the desk of every person engaged in the practice of industrial hygiene or occupational medicine. Its value lies principally in the fact that it is a very satisfactory preliminary reference, since it is not sufficiently detailed or complete to answer all the questions or solve all the problems that may arise in practice.

Persons experienced in various aspects of the practice of industrial hygiene may be disappointed by the omissions. For instance, instrumental methods of sampling and analysis are generally ignored, despite the great advances in these fields during the past few years. The uses of spectrography, x-ray diffraction analysis, polarography, and the important gas chromatographic procedures which are attracting much attention in this field are omitted.

While the analytical section should prove very helpful as a starting point for evaluating exposures to toxic materials, most industrial hygiene chemists will be surprised by the choice of some of the procedures, as for example, the selection of the archaic electrolysis and distillation method for determining mercury in preference to the proved colorimetric methods now available. The value of this section, therefore, would have been increased immeasurably if the author had seen fit to suggest more alternative procedures, if by no other means than by a reference to the literature.

This book, despite these shortcomings will prove to be a valuable addition to the library of the industrial hygiene engineer and industrial physician. However, other, more complete references should also be consulted if more than mere screening work in toxicology and industrial hygiene chemistry is contemplated.

—JACOB CHOLAK

Editorials

Worker Placement: Accentuate the Positive

The problem of assessing the work capacity of a handicapped person always presents a challenge to the examining physician. He must be fair to the individual, permitting all of the activities that will enhance the chances of employment yet prohibiting the activities which would endanger health. Beyond this, the physician, who practices in the industrial setting must conscientiously assist in the prevention of accidents. He is bound in his considerations of placement to ensure that the examinee be barred from job assignments in which there is an undue risk of accidental injury to himself, his fellow employees, or the general public.

Fitness for employment is a relative attribute. Very few persons are either completely fit for all types of work or completely unsuited for any job. The variables which determine the individual's position on the broad scale of fitness include constitutional type, the presence of illness and defect, emotional makeup, and motivation. The careful use of present examination procedures will provide the data for rough assessment of these variables, to the end that acceptably good placement recommendations can be made. Once made, it becomes necessary to convey the recommendations to both the worker and the employer in the clearest possible fashion.

In his article in this issue, Mr. Bert Hanman engagingly describes the approach that has come to bear his name. Developed during 15 years of study of the subject in this country and abroad, Hanman's method makes full use of what is revealed in the traditional clinical examination. This is augmented by "clues" of performance capacity that may be inferred from information concerning the examinee's activities around the clock—in the pursuit of hobbies, entertainment, and even in second jobs. The examiner is required then to decide what the person under consideration *can* do as distinct from the usual practice of emphasizing what he should *not* do. Emphasis is given to a total consideration of the person at hand as an individual, and to resistance of long-established tendencies to regard as equally handicapped all the persons with similar defects and disease processes.

Having decided what an examinee can do, the physician is asked to record this in terms that are positive and precise, using for this purpose Hanman's "Profile of Physical Abilities." This lists 80 physical (i.e., performance) and environmental factors in clear, outline form. Numbers, weights, and measures take the place of the terms most of us like to use: prolonged, little, moderate. The examiner is forced to decide what he means, and the meaning is communicated with a minimum chance of misinterpretation. The capacities of the person under consideration, thus recorded, are then matched against the demands of the job as set down in like terms in a "Profile of Physical Demands."

The basic exercise of matching worker qualification and job demand probably exists in some degree at all business establishments with regular medical services. There would seem to be a great deal of merit in grading this match with a uniform set of positive terms, as advocated by Hanman, rather than with a mixture of positive and negative terms that deliberately seem to avoid quantitative exactness.

"Toenail Turmoil"

It is with much regret that we call your attention to a printing error which occurred in the McNeil Laboratories' Grifulvin advertisement as it appeared in the September and October issues of this Journal. On page 4a in the September issue and on page 20a in the October issue, the toenail illustrations were inadvertently transposed. The same advertisement is printed correctly in this issue on pages 20a and 21a. Our apologies to McNeil Laboratories and their advertising agency. While we believe most of our readers recognized the error for what it was, we are indeed sorry that it occurred.

Abstracts of Current Literature

Clinical Toxicology

Lee H. Miller, M.D., I.M.D.

Common Errors in the Diagnosis of Plumbism. R. T. Johnstone.* Indust. Med. & Surg. 28:126 (March) 1959. (*520 W. 7th St., Los Angeles 14.)

Errors in the diagnosis of plumbism result not only from deviations or disinterest in the basic principles of diagnosis but from additional factors as well. Among these are inadequate histories, insufficient knowledge of the occupational environment and reliance upon laboratories that are inexperienced or poorly qualified to run determinations for lead in the urine or blood. With respect to the occupational history, physicians are "woefully inept at obtaining all of the facts." Even after detailed and careful questioning, it may be necessary to investigate the conditions at the plant. Unfortunately, opinions are often given without factual firsthand knowledge of the occupational environment. Only laboratories with adequate equipment and proper training and experience in techniques for lead analyses should be utilized. Improper methods of collection of samples as well as contaminated containers are also sources of error. The basophilic or stippled cell count as done by an ordinary laboratory technician may often be unreliable. Finally, the figures reported by the laboratory must be interpreted in relation to the history of exposure and the clinical picture.

Pulmonary Fibrosis in An Aluminum Worker. J. Mitchell. Brit. J. Indust. Med. 16:123 (April) 1959.

This article is a case report of progressive pulmonary fibrosis in a young man who was exposed to a heavy concentration of fine aluminum dust at his work. The patient worked as an agricultural laborer until he was 19. At that time (March, 1951), he obtained work in a factory that made fine aluminum powder. The finely divided aluminum powder was produced by heavy stamping machines. The range of the particle size was large. However, the quantity of dust in the atmosphere below 5 μ was of the order of 10 mg per cubic meter. A small quantity of stearine (0.5% of the total weight) was added, which formed a fine film of aluminum stearate on the surface of the particles. The worker became disabled because of breathlessness in December, 1953, and in August, 1954, he died shortly after being admitted to a hospital for respiratory failure. Five months before he died, a chest roentgenogram showed evidence of pulmonary fibrosis. Tuberculosis, syphilis, sarcoidosis, malignant infiltration, lipoid pneumonia, the reticuloses and the Hammon-Rich syndrome were excluded.

Grossly, the lungs exhibited marked generalized fibrosis (particularly in the upper lobes) and interstitial emphysema. On microscopic examination, the fibrosis was of a non-nodular type. Jagged particles in the tissue gave histochemical reactions for aluminum. The results of analyses of the lung for aluminum were as follows: root, 227 ppm of wet lung estimated as aluminum; apex, 15 ppm; base, a trace; 640 ppm estimated as Al_2O_3 was the average content calculated on the dry weight.

Since the report was submitted, the author reported that the man who replaced the former patient at work died of the same disease and two additional ambulatory cases were found.

Chelating Agents in the Therapy of Beryllium Poisoning. R. Cash, R. I. Shapiro,* S. H. Levy, and S. M. Hopkins. New England J. Med. 260:683 (April 2) 1959. (*636 Maccabees Building, Detroit)

This report is concerned with the effect of ethylenediaminetetraacetic acid (EDTA) on the urinary excretion of beryllium in 2 patients with beryllium pneumoconiosis. Although "certain industrial applications have made use of the fact that beryllium is not chelated by EDTA and have used the agent in purification of beryllium," and, "since the stability constant of beryllium with EDTA has not been determined," the authors believed that the chelating effect of EDTA with beryllium within the body could be evaluated only by empirical tests.

In the first case, the urinary excretion of beryllium during a two-day control period was 1.5 μg per day (0.7 μg per liter of urine). The total excretion of beryllium rose to almost 9 μg on the third day of therapy (almost 2 μg per liter of urine). The second case had a control excretion of 0.19 μg of beryllium per day (0.10 μg per liter of urine). On the fourth day of therapy, the concentration of beryllium in the urine was 3.66 μg per liter of urine, with a total excretion of 8.71 μg of Be during that day. As a result of their study, the authors conclude that the urinary excretion of beryllium was enhanced by the use of EDTA.

[NOTE: The control period for the urinary excretion of beryllium was only two days.]

Delayed Death Caused by Gassing in a Silo Containing Green Forage. F. M. Troisi. Brit. J. Indust. Med. 14:56 (Jan.) 1957.

Two youths collapsed and died shortly after entering a silo. The silo had been closed previously and contained remnants of green forage. A 61-year-old man attempted to rescue them, but, he too, lost consciousness. After he was retrieved, his condition improved upon the administration of artificial respiration, cardiac and respiratory stimulants, and plasma intravenously. He died five days later without regaining consciousness despite vigorous supportive therapy that included oxygen, antibiotics, and blood transfusions. The clinical picture was characteristic of prolonged anoxemia; it did not, however, respond to oxygen. Fever developed shortly after the occurrence of the incident and persisted until death. The thermoregulatory center was thought to have been damaged by the toxic effects

of carbon dioxide which was believed to have been present in a high concentration, since examination of the forage revealed the presence of an active fermentation process. The importance of providing a free opening in the base of a silo is cited as well as other safety precautions that should be practiced prior to entering a chamber that might contain a high concentration of carbon dioxide.

Dermatology

Leo J. Miedler, M.D.

The Effect of Washing with Soap of Various Composition and with Neutral Detergent on the Lipid Level on the Skin of the Hands. R. S. Laursen,* H. Efferse, A. Videboek, and K. Iversen. Acta dermat.-venereol. 39:35, 1959. (*Copenhagen, Denmark)

The authors undertook this well conceived practical study with the purpose of determining the quantities of material soluble in ether-petroleum-ether remaining on the skin of hands after washing with various soap bars, a neutral detergent bar, and water. In all the experiments the ether-petroleum-ether-soluble-carbon (EPESC) level of the skin was determined immediately before and after the completion of hand washing. The preparations used included an ordinary, unperfumed soap bar, three types of fat-supplemented soap bars (lanolin, mineral oil, triglycerides), and an unperfumed, neutral detergent bar. Twenty subjects were included in each experimental series.

The mean EPESC value before washing was $\mu gm/cm^2$ of skin (range 44-54 μgm). The mean values observed after washing with soap bars and the detergent bar varied from 18.0 to 23.3 $\mu gm/cm^2$. The observed differences between the various preparations were not statistically significant ($p>0.10$). In contrast, a significantly higher value (33.4 $\mu gm/cm^2$ was found in the experiments in which only water was used for the hand washing ($p<0.001$).

Cancer of the Scrotum in Wax Pressmen, I & II. (I) N. V. Hendricks,* C. M. Berry, J. G. Lione and J. J. Thorpe; (II) J. G. Lione† and J. S. Denholm. A.M.A. Arch. Indust. Health 19:524 and 530 (May) 1959. (*Esso Research and Engineering Co., Linden, N. J.; †Esso Standard Oil Co., Baton Rouge, La.)

These two papers combine a comprehensive dual epidemiologic and clinical approach to the problem of cancer of the scrotum in wax pressmen. Following are salient features brought forth by the study: (1) The incidence of cancer of the scrotum among wax pressmen with 10 or more years of service is many times that of the general male population. (2) The cases of scrotal cancer (11 patients) are directly associated with extensive, continuous and prolonged exposure to "slack" or crude wax in the course of wax pressing operations. (3) The neoplasms usually begin as wart-like lesions. Local infiltration and/or ulceration ultimately cause the patient to seek medical advice. (4) Primary or recurrent lesions may recur many years after treatment or cessation of exposure; hence the need of periodic careful scrotal examinations ideally at three-month intervals throughout the worker's lifetime. (5) Exposures can be minimized or prevented by modification of industrial processing, frequent bathing, and the utilization of clean and proper clothing.

Transitory Pulmonary Infiltrations, Loeffler's Syndrome in Dermatitis. H. Arvidsson* and A. Bobb. Acta dermat-venereol. 39:30, 1959. (*Department of Dermatology, Sodersjukhuset, Stockholm, Sweden)

This report opens with a brief but pertinent review of Loeffler's syndrome, in which the authors acquaint the reader with ample evidence for relating the syndrome to the various entities constituting the atopic diathesis. Furthermore, they document the less well known association of Loeffler's syndrome with generalized dermatitis. One such case of generalized nickel sensitivity dermatitis with characteristic pulmonary infiltrations is presented.

Chronic Aphthous Stomatitis, Herpes Labialis and Related Conditions: Combined Clinical Staff Meeting of the National Institutes of Health. E. Driscoll,* I. Ship, S. Baron, H. Stanley Jr., and J. Utz. Ann. Int. Med. 50:1475 (June) 1959. (*National Institutes of Health, Bethesda 14, Md.)

The clinical staff conference report of the National Institutes of Health presents an exceptionally clear picture of the clinical features, pathology, and differential diagnosis of primary acute herpetic gingivostomatitis, recurrent herpes labialis, and aphthous stomatitis. The discussion includes an appraisal of the viral aspects of the two diseases caused by the herpes simplex virus and a comprehensive survey of the multitude of factors having possible primary etiologic significance in aphthous stomatitis. The review of mechanisms favoring chronic virus infection is especially interesting.

Multiple Eczematous Sensitivities. R. L. Baer.* J.A.M.A. 170:1041 (June 27) 1959. *Department of Dermatology, New York University Post-Graduate Medical School, New York)

Drawing upon a large experience, the author reviews in schematic manner the three varieties of multiple eczematous sensitivities. These include multiple nonspecific sensitivities, multiple primary allergic sensitivities, and multiple secondary allergic sensitivities (cross-sensitizations). In the case of multiple nonspecific sensitivity there is an increased susceptibility to the primary irritant effect of many chemically and immunologically unrelated substances. Multiple primary specific allergic sensitivity is characterized by a heightened susceptibility to the development of allergic eczematous sensitizations. In the third variety, multiple secondary spe-

Abstracts

cific allergic sensitivity, there is an immunochemical relationship between the primary allergen and the secondary allergens. Included in this terse article, there is also a commentary on possible mechanisms, contributing factors, and clinical implications of these three distinct varieties of multiple eczematous sensitivities.

Internal Medicine

Leo J. Wade, M.D.

Cholangiolitic Hepatitis. E. L. Overholt* and E. B. Hardin. A.M.A. Arch. Int. Med. 103:859 (June) 1959. (*U. S. Army Medical Unit, Fort Detrick, Md.)

Acute viral hepatitis, as well as certain toxic reactions, may be characterized clinically by predominantly obstructive features. The patient has a relative sense of well-being, which is surprising in view of marked biochemical abnormalities. Hyperbilirubinemia, low urinary urobilinogen, acholic stools, bilirubinuria, increased alkaline phosphatase, and hypercholesteremia are in sharp contrast with relatively normal "flocculation" tests. Liver sections in such instances reveal few cellular changes but do show bile thrombi in the central portion of the lobules as well as variable periportal inflammatory infiltration. Extrahepatic obstruction produces a similar picture, and hence the problem of differential diagnosis is both difficult and important.

Among a series of 722 cases of infectious hepatitis, four instances of cholangiolitic hepatitis were found. The absence of any history of ingestion of drugs, exposure to toxic substances, or alchohol ingestion suggested that these cases were virus-induced. Dramatic response to steroid therapy excluded the likelihood of extrahepatic obstruction.

The Erythropoietic Factor in Hypoxic Patients With Emphysema Without Secondary Polycythemia. W. H. Whitcomb, R. M. Bird,* P. C. Johnson, J. F. Hammarsten, and Margaret Moore. A.M.A. Arch. Int. Med. 103:871 (June) 1959. (*800 Northeast 13th Street, Oklahoma City)

Secondary polycythemia is minimal or absent in instances of chronic hypoxia secondary to emphysema. The authors demonstrate, however, quantities of erythropoieten in the plasma of such patients in excess of normal. It is assumed that a refractory bone marrow is responsible for the absence of the expected polycythemia.

Leptospiral Meningitis. S. Saslaw* and E. D. Swiss. A.M.A. Arch. Int. Med. 103:876 (June) 1959. (*The Health Center, Department of Medicine, The Ohio State University, Columbus)

An increasing incidence of leptospirosis in the United States is probably more apparent than real. A higher index of suspicion and improved diagnostic techniques will undoubtedly reveal that the disease is far more prevalent than suspected. In the absence of jaudice, many cases are not recognized. Only 1 of 10 eases of meningitis reported by the authors was icteric. A careful history plus the microscopic agglutination test of Ward using killed antigens was the basis for the diagnosis. It is suggested that such agglutination studies be done on all aseptic meningitides.

The Syndrome of Chronic Pulmonary Disease and Gastroduodenal Ulceration. W. O. West,* R. O. Burns, J. M. Daniel, and H. A. Jackson. A.M.A. Arch. Int. Med. 103:897 (June) 1959. (*Department of Medicine, The Ohio State University, Columbus)

Among 845 patients admitted to the medical service, 195, or 23.1%, were believed to have chronic pulmonary disease. Gastroduodenal ulceration was demonstrated in 54 of these 195 patients (27.7%). Duodenal ulceration was found in 47, benign gastric ulceration in 4, and hypertrophic gastritis in 3 cases. A number of possible reasons for this association are discussed, but no conclusion is reached. The authors make a plea for careful gastroduodenal x-ray studies as well as stool examinations for occult blood in patients with chronic pulmonary disease.

Hyperventilation Syndrome. P. N. Yu,* B. J. B. Yim, and C. A. Stanfield. A.M.A. Arch. Int. Med. 103:902 (June) 1959. (*Strong Memorial Hospital, 260 Crittenden Blvd., Rochester, N. Y.)

The occurrence of precordial pain in a subject with the hyperventilation syndrome may present a difficult differential diagnostic problem. Inversion of the T-waves and even depression of the ST segments may occur in electrocardiograms.

The authors studied 20 patients with the hyperventilation syndrome but without organic heart disease. They reproduced the electrocardiographic changes by voluntary hyperventilation or intravenous epinephrine in 15 cases. Inhalation of CO_2 or administration of potassium prevented these changes. They postulate that hyperventilation may result in a respiratory alkalosis and autonomic stimulation. Either event can cause an intracellular potassium shift, with alterations of the membrane potential.

The Azosulfamide (Neoprontosil) Test in Clinical Evaluation of Liver Function. H. L. Möllerberg* and L. E. Böttiger. A.M.A. Arch. Int. Med. 103:949 (June) 1959. (*Karolinska Sjukhuset, Stockholm, Sweden)

Azosulfamide or neoprontosil is excreted by both the liver and the kidneys. In certain instances of impaired liver function excess quantities of the dye were excreted in the urine during the first 24-hour period. Following the intra-muscular administration of a 5% aqueous solution (200 mg) a mean excretion of 81 mg occurred in normal controls and 154 mg in patients with cirrhosis of the liver. No correlation could be demonstrated between the results of this test and serum bilirubin concentra-

tions. As in the case of many other liver function tests, interpretation of the results must take into consideration both the multiplicity of hepatic functions and the dependence of the test upon other body systems.

Industrial Hygiene

Edward C. Riley, M.D.

Finding Ultra-fine Particles with New Detector. N. E. Alexander.* Air Engin. 1:43 (July) 1959. (*U.S. Army Biological Warfare Laboratories, Fort Detrick, Md.)

This paper discusses the dust problem from several points of view, including the effect of aerosols on the human respiratory system, and presents a general discussion of a new method for evaluating the aerosol in terms of particle size and counts. "The aerosoloscope is an instrument designed to count and measure particles in an aerosol while particles are airborne. Basic light scattering theory applicable to the instrument design indicates that the instrument should have a high degree of precision; and be relatively independent of physical characteristics of the particles other than size, such as refractive index, color and shape." The aerosoloscope is capable of measuring 1,000 particles in 10 seconds, while manual methods require three to four man hours to complete this amount of work.

"The aerosoloscope could have many applications:

"1. Studies of atmospheric contamination requiring particle size information, with possible relationship to eye irritation or plant damage.

"2. Studies of particle retention in lung and nasal passages, with possible relationship to public health, industrial hygiene or cancer research.

"3. Studies of air filtering or cleaning equipment or comparative studies of other instrumentation or implementation such as samplers, impactors, etc.

"4. Studies involving the rate of physical decay of aerosols as affected by humidity, electrostatic charge or other factors.

"5. The basic design may be modified to yield a warning device indicating the presence of unusual aerosols as in mines or industrial processes."

The Value of Phase Microscopy for the Examination of Particulate Material Collected on Membrane Filters. G. Crossmon.* Am. Indust. Hyg. A. J. 20:190 (June) 1959. (*Bausch & Lomb Optical Company, Rochester, N. Y.)

The author points out the difficulty in counting particles of certain types of dust which have an index of refraction near that of the oil used to render the filter transparent and permit particulate material to be counted and its particle size determined. In such a case, the refractive index of the clearing oil is critical in two respects. First, if the oil is not of the proper refractive index, the fibers of the filter will obscure the actual dust particles; and, secondly, if it is too close to the refractive index of the dust, the dust may not be visible. The first problem was solved by finding an oil of the proper refractive index for Millipore filters of both type AA and HA. The authors found a refractive index of 1.507 at 25° C was most satisfactory and completely removed the texture of the filter. Since this presented very little contrast to certain types of silica, additional sensitivity was obtained by the use of phase microscopy. "The phase microscope is capable of differentiating very slight differences in refractive index in the specimen."

"Use of a cap analyzer and substage polarizer in combination with the phase microscope is of value for differentiation as to whether the dusts collected on the membrane filter are isotropic or anistropic." The illustrations also clearly indicate the greater ease of identifying particles by phase microscopy as compared with the usual light field technique of dust counting.

Meteorology . . . A Modern Tool of Management: Part 1. E. W. Hewson* and H. W. Baynton. Air Engin. 1:37 (July) 1959. (*University of Michigan. Ann Arbor.)

This article outlines the importance of meteorology to management in evaluating their air pollution problems. Although no detailed techniques are illustrated, such items as wind direction and speed, turbulence, stability and diffusion in inversion conditions, and others, are discussed in relation to the site and method of discharge. This is the first of a series of articles and is designed primarily to orient the design engineers and plant management as to the need for the study of climatology in reference to the engineering and economic factors which the air engineer must consider.

Noise and Hearing

Horrace O. Parrack, Ph.D.

Vibration and Noise Problems Expected in Manned Space Craft. H. E. von Gierke.* Noise Control 5: 145 (May) 1959. (*Wright Air Development Center, Aero Medical Laboratory, Wright-Patterson AFB, Ohio.)

The author reminds us that the dynamic mechanical environments of space craft are not new and that noise, vibrations, transient accelerations, and impacts are as old as aviation. It is also made clear that these mechanical disturbances can be expected to increase in magnitude in the future as the propulsive power and secondary power available increase. It is shown that man is not always the part of aviation systems most susceptible to these forces; electronic and mechanical systems frequently are equally vulnerable. Because a satisfactory environment must be assured by the design of space craft,

it is necessary to estimate the total environment at an early date and confirm the estimates by measurement at the earliest practicable date. This paper contains estimates of the anticipated environments based on the best data now available. The sources of noise, vibrations, accelerations, and shocks are enumerated, and further estimates are based on a hypothetical vehicle, but one having characteristics as near like those of a real vehicle as it is now possible to estimate. Power-plant noise and aerodynamic noise are discussed, and specific estimates are made of the energy level of these noises. The attentuation properties of the vehicle structure are considered, and then an estimate is made of the noise levels in the portion of the vehicle occupied by man. Using these estimated noise levels, a comparison is made with human tolerance criteria; the effects on communication, on the ear, and on other human functions or organs are estimated. Vibration and impulsive shocks are treated in a similar manner. Estimates of the effects of vibration on man are made by examining recent data obtained by using a high-amplitude low-frequency vibration stand. In summary, it is anticipated that noise and vibration problems will be severest during launch and reentry. Effects of noise can be reasonably well predicted. Special study is needed on vibrations in the frequency range 0.5 to 20 cps. Considerable data are presented in 19 figures contained in the paper.

Terminal Operations of 707. V. E. Callaway.* Noise Control 5:178 (May) 1959. (*Boeing Airplane Company, Renton, Wash.)

This paper contains data on the noise levels near the Boeing 707 transport aircraft during the conduct of selected operations. The operations are primarily carried out near the air terminal. The over-all sound pressure levels (OASPL), measured 200 ft. from a single JT3C-6 engine are given for operation without a suppressor and with a noise suppressor. The measurements were made along the radius of maximum radiation of sound energy in both cases. The noise levels for each octave band are: No suppressor; OASPL = 133 db; 37-75 cps = 118 db; 75-150 cps = 123 db; 150-300 cps = 128 db; 300-600 cps = 125 db; 600-1200 cps = 121 db; 1200-2400 cps = 119 db; 2400-4800 cps = 114 db; 4800-9600 cps = 112 db. Suppressor used: OASPL = 121 db; 37-75 cps = 112 db; 75-150 cps = 115 db; 150-300 cps = 110 db; 300-600 cps = 107 db; 600-1200 cps = 109 db; 1200-2400 cps = 114 db; 2400-4800 cps = 110 db; 4800-9600 cps = 104 db. The effect of reduced engine power (single engine) is shown, and for the radius of maximum energy radiation, the following data are found: 100% of dry take-off thrust, OASPL = 122 db; 63% of dry take-off thrust, OASPL = 112 db; 28% of dry take-off thrust, OASPL = 101 db; idle engine operation, OASPL = 90 db. Similar data in octave band levels are given for conditions where the airplane approaches a passenger loading gate and also when it turns and leaves the gate. Noise levels inside the gate, assuming tightly closed gates and windows, are also given for these two operations. No comparison is made with noise criteria for satisfactory communication or for damage to the human ear. No mention is made of the effects of multiple aircraft operations or of the probable durations of any single operation. All of these factors are important to those interested in man's performance and in his protection but the reader must seek guidance elsewhere.

Radiation Health

Thomas S. Ely, M.D.

Maximum Permissible Dietary Contamination After the Accidental Release of Radioactive Material from a Nuclear Reactor: Report to the Medical Research Council by Its Committee on Protection Against Ionizing Radiations. E. E. Pochin (Chairman). Brit. M. J. 1:967 (April 11) 1959.

Following the Windscale accident, the Committee was asked to advise permissible emergency exposures to the general populations following reactor accidents. Initial consideration of the problem revealed that radiation received from contaminated food and drink would be higher than that received externally and from inhalation and would be overriding except in rather special circumstances. The four isotopes of significant ingestion hazard are Iodine-131, which selectively irradiates the thyroid; strontium-89 and strontium 90, which selectively irradiate the bone; caesium-137, which produces rather uniform whole body irradiation. Permissible emergency exposures recommended by the Committee are 25 rad to the thyroid from iodine-131; 15 rad to the bone from strontium-89; 1.5 rad per year to the bone from strontium-90; and 10 rad to the whole body from caesium-137. These exposures are about equal to the annual maximum occupational exposures recommended by the I.C.R.P. Specific amounts or concentrations of these isotopes are then calculated for several age levels. Since the most likely source of highest intake in the young child is milk, some of the permissible levels could be considerably increased if children were fed dried or canned milk from another source temporarily.

Radiation Exposures of Personnel at the 60-Inch Cyclotron. Peter F. McWalters,* W. Barclay Jones, Margaret A. Kerr, and Roy F. Burton. University of California, Radiation Laboratory Report UCRL-8276, May, 1958. (*Technical Information Service Extension, Oak Ridge, Tenn.)

In the course of target setup and removal, fields of many roentgens per hour are encountered by members of the cyclotron crew. However, in spite of increasing use of the machine, a review of personnel exposure records over the period of 1953 to 1957 indicates a fall in the average weekly exposure from 0.16 to 0.10 r. This can probably be explained on the basis of increased efficiency of the crew in performing necessary operations in less

time and the use of a reliable radiation meter which displays the radiation level continuously.

Superior Chelating Agents for the Treatment of Plutonium Poisoning. J. F. Fried,* E. H. Graul, J. Schubert, and W. M. Westfall. Atompraxis 1:1 (Jan.) 1959. (*Division of Biological and Medical Research, Argonne National Laboratory, P. O. Box 299, Lemont, Ill., USA)

Until recently, EDTA had been used almost exclusively for the removal of plutonium by chelation from experimental animals and humans. Two newer agents, DTPA and BAETA, which seemed more promising from a theoretical standpoint, were tested on rats. Both were of the same order of toxicity as EDTA on a molar basis, but the therapeutic dose was well below the toxic dose. Twelve rats were given a single injection of 24.3 μg of Pu^{239} and 1.0 μc of Sr^{85} each, and divided into four groups of three. Three of the groups were treated on the 6th, 12th, 21st, 22nd, 25th, and 26th day with a total dose of 213 micromoles of one of the chelating agents, which represented 2,100 times the molar quantity of plutonium. Excreta were collected during the experiment, and on the 27th day the animals were killed and ashed. Results indicate that DTPA and BAETA were about equally effective in promoting urinary excretion of Pu, and were several times as effective as EDTA. The control animals excreted 2.4% of the injected dose, the EDTA-treated animals 6.7%, and the DTPA- and BAETA-treated animals more than 20%. No effect on strontium excretion was found. None was expected, because of the preferential binding of calcium.

Evidentiary Problems in Proving Radiation Injury. G. L. Hutton.* Am. Indust. Hyg. A. J. 20:111 (April) 1959. (*U.S. Atomic Energy Commission, Washington, D. C.)

Although 50 cases of radiation injury had been reported by 1902, the potential is even greater today, since more than 125,000 x-ray machines are in use and there are more than 5,000 radioisotope users. In a radiation injury case the plaintiff must show that the defendant owed a duty to the plaintiff to exercise a certain degree of care, that the defendant failed to exercise that degree of care, and that the defendant's lack of care resulted in damage to the plaintiff.

Radiation injury claims may pose difficult problems of causation because of the nonspecificity of most radiation-caused injury and a latent period which may be as long as 50 years. Legal action is often prevented by a statute of limitations. From the defendant's standpoint, it is important to have good records of safety procedures and good exposure records and to keep these records beyond the statute of limitations.

Radiation Reduction by Combined Copper and Aluminum Filtration in Radiography. L. E. Etter,* A. G. Kammer, J. A. Dattoli, H. Cember, C. R. Griffith, and L. C. Cross. Radiology 72:863 (June) 1959. (*3601 Fifth Ave., Pittsburgh 13)

Several measures for reducing x-ray exposures are well known, including the use of long focus-film distance, fast film, fast development, high voltage, and beam limitation. From measurements made on mannikins and human subjects, it was found that the addition of copper filtration to the more conventional aluminum filtration not only further reduced doses to the skin, bone marrow, and gonads but improved the tonal quality and detail rendition in many radiographic, fluoroscopic, image amplification fluoroscopic, and cinefluorographic procedures. The higher quality beam from the combination of 3.0 mm of aluminum and 0.375 mm of copper resulted in a higher percentage but lower absolute depth dose. Reduction of fluoroscopic skin dose was greater than 88%.

Reparative Surgery

Robert J. Trettin, M.D.

The Misuse of Antibacterials in Inguinal Herniorrhaphy. R. S. Myers.* Surg. Gynec. & Obst. 108: 721 (June) 1959. (*40 E. Erie St., Chicago.)

This is a critique of the use of antibacterials in 1,536 inguinal herniorrhaphies performed in 24 community hospitals located in seven states, participating in the Medical Audit Program developed by the American College of Surgeons and the Commission on Professional and Hospital Activities. This group of hospitals is above average in its attempts to observe high standards of patient care.

This study shows that 38.2% of all patients with simple inguinal hernias submitted to surgical repair received antibacterials at some time during hospitalization. To the group of patients with complicated inguinal hernias, incarceration, or strangulation, 52.2% received antibacterials. Significantly, 74% of the patients with simple inguinal hernias receiving antibacterials received these drugs needlessly—that is, for prophylaxis. Moreover, the drugs given in most cases, penicillin, streptomycin, and the tetracyclines, are probably without therapeutic value in the prevention of staphylococcal infections which are being encountered presently in hospitals. Such misuse of antibacterials not only exposes patients needlessly to the dangers of serious and even fatal reactions, but it also wastes much money and nurses' time.

The Multiple Transfusion Danger. R. Straus, W. T. Sweeney, and D. Plotkin. Western Journal of Surgery, Obstetrics and Gynecology March-April 1959.

With the broadening scope of radical surgical procedures dependent upon the availability of large amounts of blood for transfusion, there has developed a dangerous hemorrhagic complication which, because of its insidious onset, has been inadequately appreciated. When more than 5 units of stored blood are to be given in rapid succession,

provision should be made to have fresh blood (less than four hours old) available. It would be preferable to give direct transfusions of whole blood. In the event that fresh blood is not available, the authors suggest that 1 gm of calcium, either as the chloride or gluconate, be given intravenously for every 2 units of citrated blood. Such supplemental medication must not be injected into the bottle of citrated blood being administered.

Physiological and Clinical Effects of Buccally Given Proteases. Irving Innerfield.* J.A.M.A. 170: 925 (June 20) 1959. (*New York Medical College, New York.)

The edema that usually accompanies inflammation and the fibrosis that often follows can hinder recovery by causing dysfunction and deformity. The aim of buccal protease therapy is host-induced control and modification of localized inflammation. Unlike steriods, proteases neither inhibit nor suppress inflammation; they modify the severity and shorten the duration of a localized inflammatory reaction.

The rational use of buccal protease therapy presupposes an appraisal of disease in terms of the particular stage, duration, intensity, and degree of localization of the inflammatory reaction. Experimental and clinical reports document three significant protease-induced physiological effects: modified host response in hypersensitivity states, decreased tissue edema, and localization and liquefaction of exudates.

The pyrexia and anaphylactic reactions encountered on intramuscular administration of proteases have not been observed with buccal enzyme treatment. Evidence presented by the modifying deleterious effects of developmental and reparative phases of the inflammatory reaction in locally injured tissue. He suggests that the cardinal indication for buccal protease therapy is localized inflammation. Antibiotics remain the treatment of choice in nonlocalized inflammation.

Steroid Therapy in Surgical Patients. H. Schneewind* and W. H. Cole. J.A.M.A. 170:1411 (July 18) 1959. (*Department of Surgery, Research and Educational Hospitals, University of Illinois, Chicago)

The most important condition in which steroids are useful in treating surgical patients is that of acute adrenal insufficiency after injury or illness. The most prominent sign of this condition is persistent hypotension which cannot be explained by blood loss or coronary disease and which does not respond to adequate blood replacement. In these conditions, rapid, adequate therapy with hydrocortisone administered intravenously may be lifesaving.

Patients requiring operation who have been on long-term steroid therapy present the hazard of depression and an acute insufficiency during operation. The authors believe that the safest procedure is to prepare all of these patients with steroids prior to operation.

Corticotropin may be of value before operation by effecting a feeling of well-being and increasing appetite and food intake. Other beneficial effects of corticotropin include suppression of fever, toxicity, and malaise in conditions such as regional enteritis and diminution of hypersensitive reactions in hemolytic anemia or thrombocytopenic purpura. Under such circumstances when operation is contemplated on patients acutely ill with ulcerative colitis or purpura (less commonly with regional enteritis), administration of corticotropin may result in so much improvement that operation is made safe instead of being extremely hazardous.

Contraindications to the use of steroids include active tuberculosis, malignant hypertension, uremia, psychoses, and the presence of active ulcers in the gastrointestinal tract.

Mental Health

Graham C. Taylor, M.D.

Psychosomatic Problems in a Rapidly Growing Suburb. R. E. Gordon* and K. Gordon. J.A.M.A. 170:1757 (Aug. 8) 1959. (*Columbia University, New York.)

This report of a study in social psychiatry is based upon the medical admissions for various medical conditions in three different hospitals in three types of communities differing in their social dynamics.

The authors refer to "geographical mobility" as being different in the three communities, but it is highly probable that there are many other relevant social factors. It is observed that "sociologists and social psychologists have for some time reported on the hazards of high-speed modern life, too rapid social mobility, and too reckless efforts at getting ahead and their relationship to family disorganization, divorce, delinquency, and emotional disorder. Perhaps the rapid suburbanization of much of the American population is associated with attendant psychosomatic as well as emotional difficulties. If so, efforts at management and prevention cannot be directed at the individual patient alone—his personality, physical condition, and diet—but must also have family, *industrial* and communitywide public health features." Statistics are given for the percentage of the various disorders among different age groups in the communities, and there are sections on "Assumption of and Preparation for Responsibility in Men," "The Father-Son Problem," "Conspicuous Consumption," "Effectiveness of Insight in Psychotherapy," and "Treatment, Rehabilitation, and Prevention."

Not surprisingly, it is concluded that tension disorders are more prevalent in the rapidly growing suburban community and least prevalent in a stable rural area. What might not be anticipated is the observation that "generally, older people

had more psychosomatic illness in stable rural areas and younger persons had more in the growing suburb."

Practical Steps for the Family Physician in the Prevention of Emotional Disorder. G. Caplan.* J.A.M.A. 170:1497 (July 25) 1959. (*Harvard School of Public Health, Boston.)

The considerations set forth here for the family physician apply equally to the occupational physician in general, although with modifications in that the latter is concerned more with the employees' interpersonal relations on the job than with the family structure. In the introduction the author observes that "the mental health of an individual is dependent on the continuous satisfaction of special requisites in the patterns of his psychological interaction with certain other people." Psychological needs involve relationships with small groups of people who are bound together by significant emotional ties. The role of the physician in helping people at times of crisis is stressed. "People become emotionally disturbed during these crisis periods, but the anxiety, depression, tension, and hostility are not to be confused with symptoms of psychiatric illness, which they superficially resemble. They are the signs in the emotional sphere which show that an active struggle is in process inside that individual in his attempts to wrestle with his problems. At the end of the few weeks of crisis these symptoms will disappear, once some kind of solution has been achieved. This solution may be a healthy one. On the other hand it may be an unhealthy one, and in that case either at once or in the future the individual will manifest neurotic or psychotic symptoms which represent a pathological way of dealing with his life problems through some form of irrational and psychologically distorted pseudo-solution."

In safeguarding healthy relationships the physician will employ a technique of anticipatory guidance and keep open channels of communication between the people involved in the problem.

Concerning the need for psychiatric consultation the author emphasizes the importance of building up a collaborative working relationship with the psychiatrist so that each can get to know the language and way of working of the other. The psychiatrist could help the physician achieve more effective understanding and management of problems confronting the physician and could also help the physician understand better his own feelings and reactions. "This is not a matter of the giving or the receiving of intellectual prescriptions but the emotional education which comes from numerous discussions about the details of practical life situations and one's feelings about them."

This consultation is a two-way process involving the education of the psychiatrist to the daily problems of general practice. The management plan which emerges from the consultation must be implemented by the family physician and fit into his general framework; this applies equally to collaborative consultation with the occupational physician.

The author concludes that the skills acquired by the physician in this process will be of value in the prevention of mental illness.

Experimental Toxicology

R. E. Eckardt, Ph.D., M.D.

Nickel Poisoning: IX. Carcinogenesis in Rats Exposed to Nickel Carbonyl. F. W. Sunderman,* A. J. Donnelly, B. West, and J. F. Kincaid. A.M.A. Arch. Indust. Health 20:36 (July) 1959. (*Jefferson Medical College, Philadelphia)

Lung tumors were induced in rats exposed three times weekly for one year to 0.03 or 0.06 mg/liter of nickel carbonyl or to a single dose of 0.25 mg/liter (exposure times not specified). Rats surviving the 12-month and single exposures were observed until death 24-30 months after the studies were started. The first tumor-bearer to die (one year after the last exposure) was in the first group (0.03 mg/liter); none of the other 10 survivors of the year's exposure in this group had lung tumors. The lesions are described as multiple masses of clear-cell carcinoma having an adenocarcinomatous pattern, but differentiating toward a squamous-cell type in some areas. The second tumor-bearer to die (also about one year after exposure) was from the single exposure group; the tumors were morphologically the same as those above, but some areas gave evidence of more anaplastic malignancy. The only other tumor-bearing rat in this group was killed 30 months after the single exposure. The tumors were not grossly visible, but two small papillary bronchial adenomas, similar to the spontaneous rat lung tumor reported by horn and Stewart, were evident microscopically. In the second repeated exposure group (0.06 mg/liter), tumors were seen in one of the three rats surviving the one year of exposure. At autopsy 15 months after the last exposure, a relatively small tumor was seen, consisting of moderately sized, slightly basophilic cells outlined by stroma in a fashion suggesting an alveolar spacing. There was some differentiation toward a squamous-cell type in some areas.

New Studies on Aerosols: IV. Effect of Five Dust Particles on Excised Guinea-Pig's Lung Before and After Sympathomimetic Aerosols. L. Dautrebande, L. L. Delaunois, and C. Heymans. Arch. Internat. Pharmacodyn. 116:187, 1958.

Inhaling submicronic solid, chemically inert particles (even insoluble ones such as quartz, calcium carbonate, uranium oxide, and titanium oxide) induces the excised lungs' respiratory amplification to constrict, sometimes down to a state of severe hypoventilation. This is brought back to normal, and sometimes above normal, by administering a

powerful sympathomimetic aerosol after dust inhalation. After the dilator aerosols have produced their effects, the dust particles fail to constrict the lungs. When administered prior to the dust particles, the dilator aerosols completely inhibit their constricting effects.

The Hepatocarcinogenicity of Tannic Acid. B. Korpassy.*Cancer Res. 19:501 (June) 1959. (*University Medical School, Szeged, Hungary)

Hepatomas and/or cholangiomas developed in 56% of rats that survived 100 days of treatment: subcutaneous injections every fifth day with 150-200 mg of tannic acid per kilogram as a 1.5% or 2% aqueous solution. This hepatocarcinogenic effect was inhibited by a high casein-low fat diet and promoted by the reverse. Local carcinogenic effects were not observed nor did they occur after skin painting for one year. In mice neither removed or local tumors were seen on repeated skin painting. Tannic acid also greatly enhanced the hepatocarcinogenic action of 2-acetylaminofluorene administered in food when given parenterally simultaneously with it. The advanced liver cirrhosis seen in these tests suggests that tannic acid may be a promoting factor in liver carcinogenesis. The significance of these results with respect to excessive consumption of tannic acid-containing beverages is discussed.

Medical Care Administration

Asa Barnes, M.D.

Role of Government and the Community in Preventive Medical Services. B. Moreell.* Indust. Med. & Surg. 28:246 (May) 1959. (*Chairman of the Board, Jones & Laughlin Steel Corporation, Pittsburgh)

Individuals have an important role in preventive medicine, not only with respect to welfare of their neighbors but also with respect to their own person. No individual can delegate to another individual or to a group or to government the entire responsibility for his physical well-being. He often needs advice and guidance. Industry can take the initiative through a preventive health program. Some of the basic elements are (1) statistical—to collect, tabulate, and analyze data on the mass manifestation of disease in man; (2) research—to discover the environmental factors responsible for the propagation of disease; (3) preventive — to make suitable changes in man or in his environment or in both to interrupt new case production.

Today there is a dangerous tendency to leave all problems to government. We should keep government powers to a minimum. There is a proper area for government action with respect to public health activities. These are research, demonstration, action programs, and education. A considerable part of our basic environmental activities is beyond the control of government and the responsibility for proper action is with the individual.

American industry is financing a large number of hospital and medical care programs. The dollars spent run into an item of great significance. One wonders why industry appears to have so little concern for the results it obtains for the expenditure of these huge sums.

The social impact of illness, disability, and death is incalcuable. If we are to charge individuals with the responsibility for self-discipline, then they must have sufficient education to achieve understanding, after which we should exercise persuasion and evangelization so that they may grow in wisdom.

Ladies Garment Workers' Health Plan. L. Price.* Pennsylvania M. J. 62:413 (March) 1959. (*Union Health Center, New York)

The Union Health Center established in 1913 was the first such institution developed by a labor union in this country. It serves a potential of 200,000 workers. Service is restricted to ambulatory patients and is as complete as could be found in any hospital outpatient department. Emphasis has been placed on early detection and treatment of chronic diseases and preventive medicine.

The union pays limited indemnities for hospitalization, surgery, maternity, and sickness insurance during periods up to 26 weeks a year. Funds are derived from a 3.5% employer contribution to a health and welfare fund. This labor union's attempt to meet the health needs of its members was in direct contrast to the plans being developed by big industry, whose chief motive was to improve labor-management relations, reduce absenteeism, and lower compensation costs and, secondarily, to take care of some of the economic and medical needs of the employees.

Organized medicine has insisted that the best form of care can be provided only where there is free choice and fee for service. The greatest objection to indemnity plans is the rising out-of-pocket cost to the beneficiaries. The medical profession has had to deal with third parties since the earliest days of medical practice in this country. Unions are attracted to comprehensive closed-panel medical service plans because the cost of medical care can be covered by a predetermined premium and the competency of the participating physician may be assured.

Third parties in medicine are obligated to operate their programs economically and efficiently. Organized medicine must assure that competence will accompany free choice and that proper fees will be charged.

About the Authors

JEAN SPENCER FELTON, M.D., is Professor of Occupational Health at the University of California at Los Angeles, with appointments in the School of Public Health and in the Department of Preventive Medicine in the School of Medicine. DR. FELTON, a native of California, obtained his A.B. and M.D. degrees from Stanford University. After a brief period of medical practice in San Francisco, he was called to the Army in December, 1940, and served five and a half years as an industrial medical officer in this country, the Philippine Islands, and Japan.

From 1946 to 1953, DR. FELTON was Medical Director at the Oak Ridge National Laboratory, Oak Ridge, Tenn. During this time he developed original methods of health education and programs of employee health improvement, with some emphasis upon mental health. These experiences were the basis of an impressive list of publications. He was the first recipient of the Industrial Medical Association's Merit in Authorship Award, at the annual meeting in Boston in 1948. At about this time he began a long period of service to the Section on Preventive and Industrial Medicine of the American Medical Association.

In 1953, DR. FELTON went to the University of Oklahoma as Associate Professor of Preventive Medicine, later Professor, in the School of Medicine. As might have been predicted, the whole field of undergraduate education in industrial medicine began to arouse from a coma as a result of reverberations that emanated from Oklahoma City. His article in this issue, "A Work Evaluation Clinic," derives from one of the many impressive enterprises that has sprung from his imagination and energy.

D. JOHN LAUER, M.D., president of the Industrial Medical Association, is author of the article in this issue entitled, "Modern Rehabilitation — An Industrial Physician's Appraisal." Dr. LAUER operates widely and effectively on several planes concurrently. He is at once the president of IMA, and of its Pittsburgh component society; Chairman of the Allegheny County Board of Health, and a member of the Advisory Health Board of the Commonwealth of Pennsylvania; an active participant in the affairs of the University of Pittsburgh, where he is Associate Clinical Professor of Occupational Medicine; a member of two hospital staffs; and the head of a family of seven children. Less well known has been the steady development of the industrial medical services of Jones and Laughlin Steel Corporation since DR. LAUER became that organization's medical director, in the fall of 1951. Broadly and boldly conceived considering the nature of the industry, the times, and the communities involved, the in-plant services of J & L may now be listed among the best to be found in the country.

After graduating in medicine from the University of Minnesota, DR. LAUER established a general practice in St. Paul in 1938. He served in the Navy during the war, with assignments in industrial medicine. After the war he was the first student in the graduate training program in industrial medicine at University of Pittsburgh and was awarded the degree, Doctor of Industrial Medicine. He then moved to Cincinnati, where he provided industrial medical services to small industries and was Assistant Professor of Industrial Medicine at the University.

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About the Authors

BERT HANMAN, B.S., M.A., author of "Clues in Evaluating Physical Ability," a Californian now living in Boston, has spent the past 20 years in developing techniques for analyzing the physical makeup of both workers and jobs from the medical point of view, the purpose being to assist the industrial physician in bringing about safe and productive employment for each worker, especially for disabled and older workers. As a researcher and private consultant in this field, MR. HANMAN'S work has taken him to 14 countries and all but two states in America. He has personally installed his "specific method of job placement and adjustment" (or "Hanman Plan," as others often refer to it in the literature) in some 50 industrial establishments of all sizes, the most recent being at the Massachusetts General Hospital in Boston. Many other firms have applied his work on their own with the assistance of published data pertaining to the plan.

For his contributions to Swedish medicine in industry, MR. HANMAN was decorated by the King of Sweden as a Knight of the Vasa Order in 1950. A year later he was made a member of the World Health Organization Expert Advisory Panel on Social and Occupational Health. At present he is a consultant to the John Hancock Mutual Life Insurance Company, previously having served the Liberty Mutual Insurance Company and the American Mutual Liability Insurance Company, all at their home offices in Boston. Each year he lectures on his work to industrial physicians attending postgraduate courses at the Harvard School of Public Health, New York University, and the University of Pennsylvania.

MR. HANMAN'S first book, "Physical Demands and Capacities Analysis," was co-authored with DR. CLIFFORD KUH in 1944 after a sizable study at the Kaiser shipyards in California in a pioneering effort to find out how to evaluate physical ability for industrial activity. After numerous other original researches, Mr. Hanman's text, "Physical Capacities and Job Placement," appeared in 1951; and then came "Physical Abilities To Fit The Job" in 1956.

He has also published 22 articles in professional journals at home and abroad. One of the more important of these "The Evaluation of Physical Ability," appeared in the *New England Journal of Medicine* (258:986-993, 1958) and is the introductory forerunner of his present article in this issue. It is noteworthy in these recent works that he has now developed and extended his techniques to cover the 24-hour day for all persons. "With this knowledge a physician can point the way for his patients both to utilize and to protect their remaining physical resources in seeking a more rewarding life of fuller and safer activity around the clock—whether workers or housewives,

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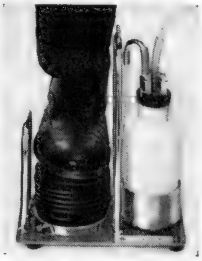

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young or old, athletes or severely disabled persons."

HERNAN OYANGUREN, M.D., of Santiago, Chile, is known to many occupational health specialists in this country as a result of two extended visits. The first of these, during 1946-47, was spent in a combined course of research and work at Saranac Laboratory and at the Harvard School of Public Health. The more recent visit, in the spring of 1958, was spent as an observer at various research and teaching centers of occupational medicine. He went on to Europe to study administrative schemes for providing health services to industrial workers, and to participate in conferences in Rome, Lyon, Brussels, and Geneva. He will be recalled also as a co-author of articles on manganese poisoning and stannosis which have appeared in the American literature.

The comprehensive social security system of Chile includes a National Health Service. This Service has two primary divisions: one which develops plans and provides over-all consultations, called the Central Bureau; and another, called the General Bureau, which provides all of the health services of the program. DR. OYANGUREN heads the occupational health activities of the former. He is well qualified to present the article which appears in this issue, "The Development and Practice of Occupational Health in Chile."

DR. OYANGUREN received the M.D. degree from the University of Chile in 1936. Thereafter he worked as an internist in tuberculosis hospitals and sanatoria until 1953. After two years in pneumoconiosis research, he moved into his present position as Head of the Occupational Medicine Section, the Sub-Department of Occupational Health, in the Central Bureau of the National Health Service.

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*Peck, S. M., and others: A.M.A. Arch. Dermat. and Syph. 67:263, 1953.

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People and Events

► HOWARD K. SESSIONS, M.D., became Director, Division of Health Specialties for the Georgia Department of Public Health as of October 1. He retired from the U.S. Navy in September, after 32 years of service. He held the rank of Rear Admiral at the time of his retirement.

DR. SESSIONS obtained his M.D. degree in 1931 from Emory University in Georgia. He immediately joined the navy and interned at U.S. Naval Hospital in Brooklyn. Throughout his naval career, he has served in numerous medical capacities at many naval bases. In 1942 he was Senior Medical Officer on a team to inspect selected Shipyards and establish minimum requirements in industrial health. These recommendations were accepted and published as "Minimum Requirements for Safety and Industrial Health in Maritime Commission and Navy Contract Shipyards."

He served aboard the *U.S.S. Texas* in 1944 and 1945, participating in the Normandy invasion in June, 1944. He received the bronze star with combat "V" for preparation for, and participation in, this action and care of wounded Rangers brought in from the beach. He also participated in the Iwo Jima invasion in 1945.

DR. SESSIONS did graduate work at Harvard University School of Public Health and obtained a certificate in Industrial Hygiene in 1941. He received a Master of Public Health degree from Johns Hopkins School of Hygiene and Public Health in 1947.

From 1955 until his retirement from the navy, DR. SESSIONS was Director of the Preventive Medicine Division, Bureau of Medicine and Surgery, Washington, D. C. He was certified in Occupational Medicine by the American Board of Preventive Medicine in 1956.

► G. H. PETERSON, M.D., became Plant Physician for the Janesville plant, Fisher Body Division, General Motors Corporation, as of October 1. He had been Plant Physician for Fairbanks, Morse & Company, Beloit, Wisconsin, since 1946.

DR. PETERSON graduated from Northwestern University Medical School in 1935 and interned at West Suburban Hospital in Oak Park, Illinois. He spent the next six years in private practice in Elgin, Illinois. From 1942 to 1946, he served with the U.S. Air Force in army operated industrial plants at Tinker Field, Oklahoma and Watson Laboratories, Red Bank, New Jersey. He held the rank of major at the time of his discharge.

DR. PETERSON is a Fellow of the Industrial Medical Association, and the American Medical Association.

► R. L. FRANSWAY, M.D., has been appointed Clinical Investigator for Parke, Davis & Company, in which capacity he will study the human pharmacology of new drugs. In addition to these duties, he will assist E. M. ROTARIUS, M.D., in the supervision of local medical facilities.

DR. FRANSWAY was Plant Physician for the Wayne Assembly Plant of the Ford Motor Company before Parke, Davis. He received his M.D. degree from the University of Wisconsin in 1951 and interned at Mercy Hospital in Des Moines. He was Assistant Medical Director for Continental Assurance Company in Chicago during 1952 and 1953, and was in general practice in Fon du Lac, Wisconsin from 1953 to 1956. He then spent a year of residency in pathology at St. Joseph's Hospital in Milwaukee before joining Ford.

DR. FRANSWAY is a member of the Industrial Medical Association, the American Academy of General Practice and the American Medical Association.

► WILFRED N. SISK, M.D., has joined the Florida State Board of Health in Jacksonville. Dr. Sisk previously was Assistant Physician for the Phillips Petroleum Company in Phillips, Texas, and prior to that was for many years head of the industrial health department of The Upjohn Company, Kalamazoo, Michigan.

► JOSEPH B. RUFFIN, M.D., has been appointed Staff Physician at the Fontana Works of the Kaiser Steel Corporation. In addition to his general dispensary duties, he will work with HALLET A. LEWIS, M.D., Medical Director, in the administration of the management health program, and the industrial hygiene program.

DR. RUFFIN did his undergraduate work at the University of Illinois and obtained his M.D. degree from the Stritch School of Medicine, Loyola University, Chicago,

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People and Events

in 1953. He did postgraduate work at the University of Cincinnati's Kettering Laboratory from 1956 to 1958. The third year of his training in occupational medicine was spent with the Division of Industrial Hygiene, Ohio Department of Health. This assignment was completed just prior to his affiliation with Kaiser.

► A. M. PULEO, M.D., has been named Medical Director for Addressograph - Multigraph Corporation in Euclid, Ohio.

DR. PULEO received his M.D. degree from Western Reserve University School of Medicine in 1940. He interned at Cleveland City Hospital, and was Assistant Medical Superintendent there from 1942 to 1944, at which time he joined Jack & Heintz, Inc., as Assistant Medical Director. He was associated with that organization for 10 years, with a one year interruption for service with the U.S. Navy in 1945-1946.

When he returned to Jack & Heintz, he was made Medical Director, a position he held until 1954, when he joined the Euclid Clinic Foundation. He remained with the Clinic until accepting his present position.

► RALPH T. COLLINS, M.D., consultant in neurology and psychiatry for Eastman Kodak Company has been appointed by GOVERNOR NELSON ROCKEFELLER of New York to a nine-man council on rehabilitation. The council has been created to advise the governor on ways of strengthening and expanding the state's rehabilitation program.

DR. COLLINS received his M.D. degree from Albany Medical College in 1932. He was a lieutenant colonel in the U.S. Army in World War II and joined Kodak in 1946. In 1955 he was appointed to President Eisenhower's Committee on Employment of the Physically Handicapped.

► Industrial Medical Association of Pittsburgh elected the following officers and directors at a meeting held on September 18: President—DANIEL V. DOUGHERTY, M.D.; President-Elect — DANIEL C. BRAUN, M.D.; Vice-President—J. L. THOMPSON, M.D.; Secretary-Treasurer—MERLE BUNDY, M.D.; directors (1958-1960)—E. V. HENSON, M.D., WARREN L. HOGUE, JR., M.D., EDWARD M. KLINE, M.D., and D. JOHN LAUER, M.D.; directors (1959-1961)—S. W. PARKS, M.D.; WILLIAM J. RALSTON, M.D., and WILLIAM M. WOODWARD, M.D.

► New Jersey Industrial Health Conference was held October 24 at Far Hills Inn in Somerville, N.J. The meeting was sponsored by the New Jersey Industrial Nurses Association, the Industrial Medical Association of New Jersey, the New Jersey Section of the American Industrial Hygiene Association, and with the cooperation of the Industrial Section of the Academy of Medicine of Northern New Jersey.

At the opening session, a film on "Hearing Conservation" was presented, which was followed by an address entitled "The Present Legal Implication of the Industrial Noise Problem" by Noel S. Symons, attorney.

The other speakers and their topics included: DR. HERBERT FOX — "Drugs — Their Discovery and Development"; ROBERT R. RIESZ—"Human Engineering"; HERVEY B. ELKINS, Ph.D. — "International Symposium on Maximum Allowable Concentrations of Toxic Substances in Industry"; MITCHELL R. ZAVON,

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► Central States Society of Industrial Medicine and Surgery will hold its winter meeting at the Sheraton-Jefferson Hotel in St. Louis on December 5. Some 24 local and national medical groups and related organizations will cosponsor the meeting.

PAUL DUDLEY WHITE, M.D., will be the keynote speaker at the luncheon meeting. At the morning session, papers will be presented on the national importance of diabetes, mental health, arthritis and tuberculosis. The afternoon session will feature four consecutive panel discussions on the same subjects discussed in the morning.

► A 20-minute color film entitled "Air Force Industrial Medicine in Action" has recently been produced by the United States Air Force. It illustrates the investigation and solution of an occupational health problem in an Air Force manufacturing establishment to which attention was attracted by an unusually high rate of absenteeism in one of the operations.

According to a review of the film by the Council on Industrial Health of the American Medical Association, it presents the philosophy that industrial medicine should be primarily concerned with prevention and shows clearly the "team" approach necessary to industrial health.

The film is available without charge from the Armed Forces Film Library Center, St. Louis 23, Mo.

► Industrial Medical Association is now represented by District Counselors in Puerto Rico and Cuba. President D. JOHN LAUER, M.D., has appointed H. VAZQUEZ-MILAN, M.D., as District Counselor for Puerto Rico, and RAFAEL PENALVER BALLINA, M.D., as District Counselor for Cuba.

► The theme of the 1960 National Health Forum will be "Positive Health of Older People." The Forum, convened annually by the National Health Council, will be held in Miami Beach in 1960 from March 14 to 17. Participants will include not only representatives of the health professions and the vol-

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People and Events

untary and governmental health agencies, but also legislators, leaders of business, industry and labor, welfare, religion, recreation, and civic organizations.

EDWARD L. BORTZ, M.D., a former president of the American Medical Association, is chairman of the 1960 Forum Committee. He has received nation-wide recognition for his effotrs to help older people attain satisfying, healthful living.

► LEMUEL C. MCGEE, M.D., Medical Director of the Hercules Powder Company, spoke at the September 23 meeting of the Industrial Medical Association of Philadelphia. The subject of the discussion was "Objective and Functional Aspects of Disability."

► New York State Association of Industrial Nurses will hold its Eighth Annual Health Conference at the Hotel Commodore in New York City on November 6. The program theme is "Triple M's for Industrial Nurses." The three M's, which represent the main sections of the program are: "Mechanics of Organization," "Mechanics of Modern Nursing Procedures," and "Mechanics of Stress." A large part of the program will be devoted to panel discussions on various aspects of these topics.

► The American Medical Association and the United States Public Health Services' National Library of Medicine in Washington announced jointly today that, beginning January 1, 1960, they will institute a new program for the indexing of medical literature which is estimated at 220,000 articles annually.

Here, briefly, is how the new indexing system will work:

1. The American Medical Association will discontinue publication of its "Quarterly Cumulative Index Medicus," compiled by the library staff. This Index served as an invaluable aid to physicians, teachers, editors and writers, students and libraries since it was started in 1916.

2. The "Current List of Medical Literature," published by the National Library of Medicine, will be expanded in coverage to include currently published medical periodicals not covered in the past by either the National Library or the A.M.A.

3. Beginning with the issue of January 1960, the "Current List of Medical Literature" will appear in a revised format, using improved composition techniques, and will be renamed "Index Medicus." The new "Index Medicus" will be published monthly by the National Library of Medicine, and will be available on a subscription basis through the Superintendent of Documents, Government Printing Office.

4. The A.M.A. will publish annual cumulated volumes of the new index, which will be known as the "Cumulated Index Medicus," beginning with the volume for the calendar year 1960. The A.M.A. will bear the cost of publishing the "Cumulated Index Medicus," independently of the National Library. In publishing this index the A.M.A. will use cumulative copy, in the form of film negatives, prepared and furnished by the National Library of Medicine.

► T. J. Noonan Company, Boston, a distributor of hospital, medical and laboratory supplies in the New England area, has been acquired by the Brunswick-Balke-Collender Company, Chicago, and will be operated by A. S. Aloe Company, a major division of Brunswick.

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